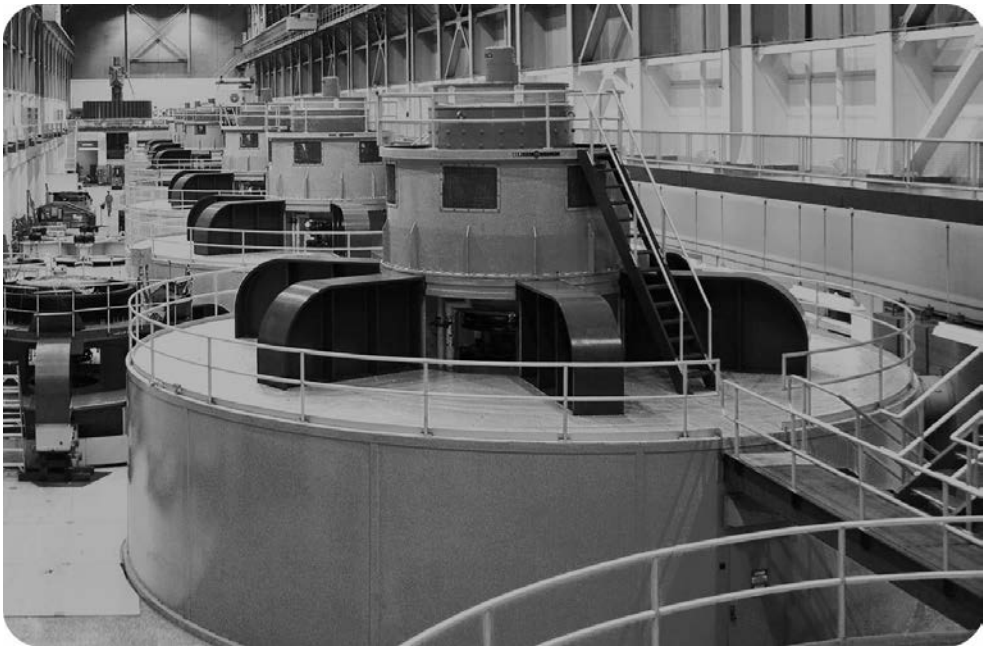
User Manual

Allen-Bradley

XM Dynamic Measurement Module

Catalog Number 1440-DYN02-01RJ



Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

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What This Preface Contains

This preface describes how to use this manual.

Who Should Use This Manual

This manual introduces you to the Dynamic Measurement module. It is intended for anyone who installs, configures, or uses the Dynamic Measurement module.

Common Techniques Used in This Manual

There are several document conventions used in this manual, including the following:

The Dynamic Measurement module is referred to as XM® Dynamic Measurement module, device, or XM module throughout this manual.

TIP A tip indicates additional information which may be helpful.

EXAMPLE This convention presents an example.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
XM Monitoring Modules Specifications Technical Data, publication 1440-TD001	Provides specifications for the 1440 series of Rockwell Automation monitoring modules.
XM ControlNet Adapter Installation Instructions, publication ICM-IN001	Provides information about mounting the Dynamic Measurement module and technical specifications.
XM Dynamic Measurement Module Installation Instructions, publication ICM-IN002	Provides installation instructions for the XM Dynamic Measurement Module.
XM ControlNet Adapter User Manual, publication ICM-UM001	Provides details about how to install, use and configure the adapter.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Introduction

This chapter provides an overview of the Dynamic Measurement module. It also discusses the components of the module.

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About the Module

The Dynamic Measurement module is part of the Allen-Bradley™ XM® Series, a family of distributed machine condition monitoring and protection devices.

IMPORTANT The 1440-DYN02-01RJ must reside on its own network that is dedicated to one 1440-ACNR module and one to ten 1440-DYN02-01RJ modules. Other XM family member modules may not be mixed with the 1440-DYN02-01RJ on the same network.

The 1440-DYN02-01RJ is a 2-channel general purpose monitor that supports measurements of dynamic inputs such as vibration, pressure, and strain. The module can be used for monitoring shaft, casing, and pedestal vibration in rotating equipment.

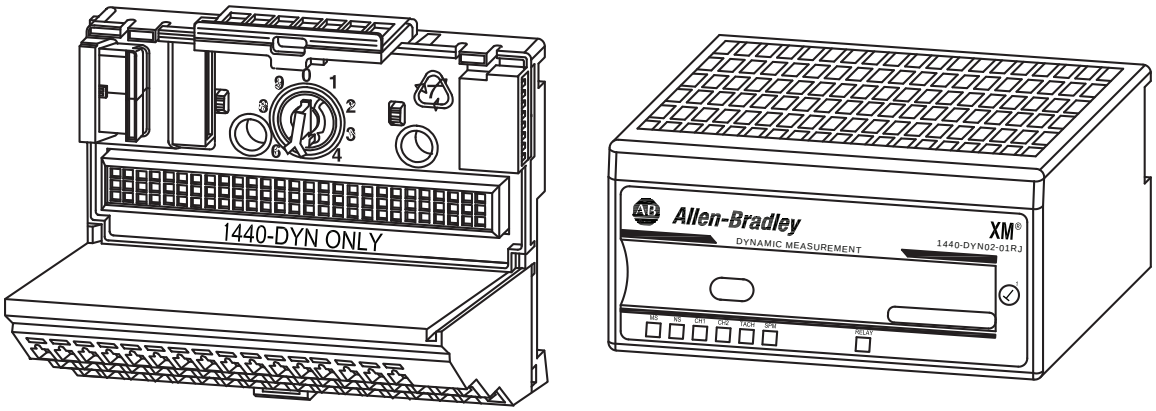
Inputs accepted include any Allen-Bradley non-contact eddy current probe, a standard integrated electronics piezoelectric (IEPE) accelerometer, a velocity transducer, AC voltage output, or a DC voltage output measurement device. The module also accepts a tachometer input to provide speed measurement and order analysis functions. The module can work with most tachometer signal sources including eddy current probe, unpowered magnetic probe, and other powered and unpowered tachometer sensors.

The module provides onboard processing of critical vibration parameters, as well as advanced alarm and relay logic. It can be integrated with existing automation and control systems, including PLCs and displays, to provide information to aid in protecting machinery from catastrophic failures.

Module Components

The Dynamic Measurement module consists of a terminal base unit and an instrument module. The Dynamic Measurement module and terminal base are shown below.

Figure 1.1 Module Components



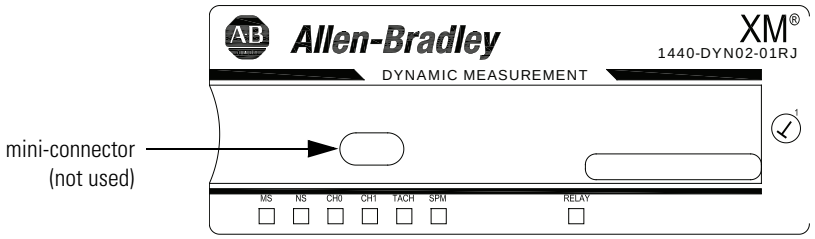
Dynamic Measurement Terminal Base Unit
Cat. No. 1440-TBS-J

Dynamic Measurement Module
Cat. No. 1440-DYN02-01RJ

- Dynamic Measurement Terminal Base - A DIN rail mounted base unit that provides terminations for all field wiring required by the Dynamic Measurement module.
- Dynamic Measurement Module - The module mounts only on the 1440-TBS-J terminal base via a keyswitch and a 96-pin connector. The module contains the measurement electronics, and processors.

IMPORTANT The mini connector located under the label on the top of the module is not used.

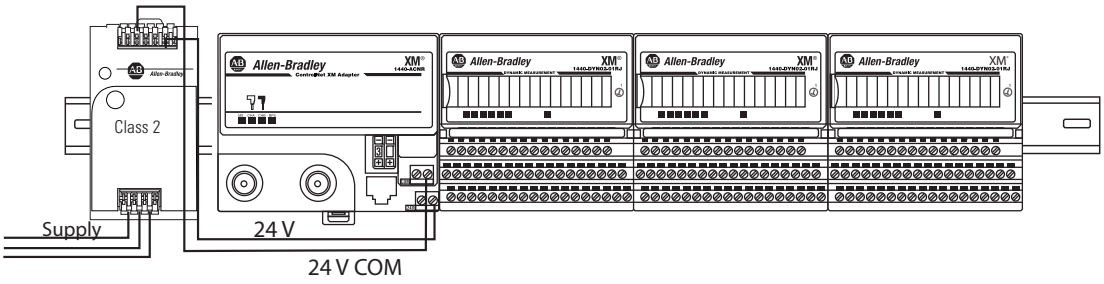
Figure 1.2 Mini-Connector



XM Bus

The XM Bus connector, located on each side of Dynamic Measurement module, connects the module to the 1440-ACNR adapter and other 1440-DYN02-01RJ modules on the DIN rail, as illustrated below.

The 1440-ACNR module operates as a communication adapter for 1440-DYN02-01RJ modules. It provides an interface for controlling XM1440-DYN02-01RJ modules on the XM Bus and transferring data to the processor over a ControlNet network. For more information about the 1440-ACNR, refer to publication ICM-UM001.



The XM Bus connector passes power and XM communications between the connected modules. The XM Bus communicates using standard DeviceNet protocols and CAN transceivers, but it does not share the same specifications for the media (wire) and isolation characteristics.

ATTENTION

The total current draw through the XM Bus connector cannot exceed 3 A. Multiple power sources are not allowed.

ATTENTION

To comply with the CE Low Voltage Directive (LVD), all connections to this equipment must be powered from a source compliant with the following: Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

To comply with UL restrictions, this equipment must be powered from a source compliant with the following: Class 2.

Notes:

Installing the XM Dynamic Measurement Module

This chapter discusses how to install and wire the Dynamic Measurement module (Cat. No. 1440-DYN02-01RJ). It also describes the module indicators and the basic operations of the module.

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ATTENTION

Environment and Enclosure

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1, for additional installation requirements.
- NEMA Standard 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosures.

ATTENTION

Prevent Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

European Hazardous Location Approval

The following applies when the product bears the Ex Marking.

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC and has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in Zone 2 potentially explosive atmospheres, given in Annex II to this Directive.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-15 and EN 60079-0.

ATTENTION

This equipment is not resistant to sunlight or other sources of UV radiation.

WARNING

This equipment must be mounted in an ATEX certified enclosure with a minimum ingress protection rating of at least IP54 (as defined in IEC60529) and used in an environment of not more than Pollution Degree 2 (as defined in IEC 60664-1) when applied in Zone 2 environments. The enclosure must utilize a tool removable cover or door.

WARNING

This equipment must be used within its specified ratings defined by Rockwell Automation.

WARNING

Provision must be made to prevent the rated voltage from being exceeded by transient disturbances of more than 140% of the rated voltage when applied in Zone 2 environments.

WARNING

This equipment must be used only with ATEX-certified Allen-Bradley terminal bases.

WARNING

Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.

WARNING

Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations.	**Informations sur l'utilisation de cet équipement en environnements dangereux.**
Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.	Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.
WARNING 	**Explosion Hazard** • Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. • Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. • Substitution of components may impair suitability for Class I, Division 2. • If this product contains batteries, they must only be changed in an area known to be nonhazardous.
WARNING 	**Risque d'Explosion** • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. • La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. • S'assurer que l'environnement est classé non dangereux avant de changer les piles.

XM Installation Requirements

This section describes wire, power, grounding, and terminating resistor requirements for an XM system that includes one 1440-ACNR ControlNet Adapter module, and from one to ten 1440-DYN02-01RJ Dynamic Measurement modules.

IMPORTANT The installation requirements may be different for different XM modules. The following requirements apply only to the 1440-DYN02-01RJ module. Refer to the user manual for the specific XM module for its requirements.

Wiring Requirements

Use solid or stranded wire. All wiring should meet the following specifications:

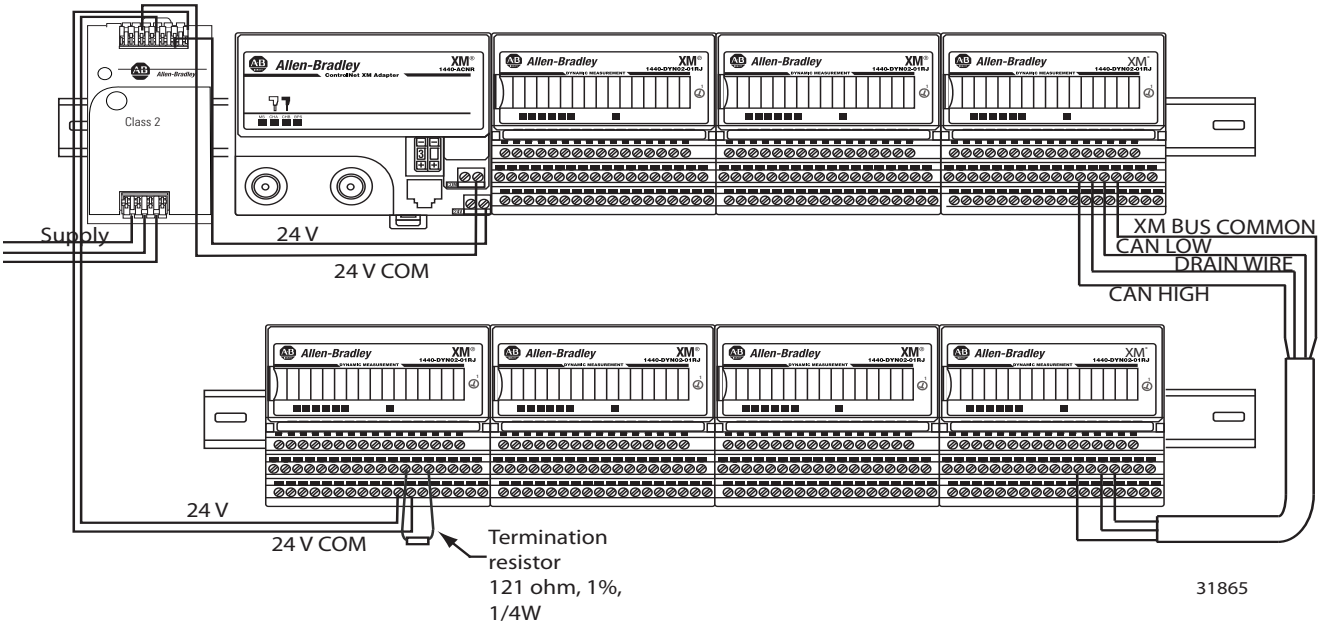
- 14 to 22 AWG copper conductors without pretreatment; 8 AWG required for grounding the DIN rail for electromagnetic interference (EMI) purposes
- Recommended strip length 8 millimeters (0.31 inches)
- Minimum insulation rating of 300V
- Soldering the conductor is forbidden
- Wire ferrules can be used with stranded conductors; copper ferrules recommended

Power Requirements

Use a single Class 2 power supply to power the XM modules. Before installing your module, calculate the power requirements of all modules in each chassis. The total current draw through the side connector cannot exceed 3 A. Refer to the specifications for the specific modules for power requirements.

Figure 2.1 is an illustration of wiring modules using separate power connections.

Figure 2.1 XM Modules with Separate Power Connections



ATTENTION

To comply with the CE Low Voltage Directive (LVD), all connections to this equipment must be powered from a source compliant with the following: Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

To comply with UL restrictions, this equipment must be powered from a source compliant with the following: Class 2.

ATTENTION

Multiple power sources are not allowed.

TIP

See Terminal Block Assignments on page 28 for the terminal block assignments and descriptions for the Dynamic Measurement module.

Grounding Requirements

Use these grounding requirements to ensure safe electrical operating circumstances, and to help avoid potential EMI and ground noise that can cause unfavorable operating conditions for your XM system.

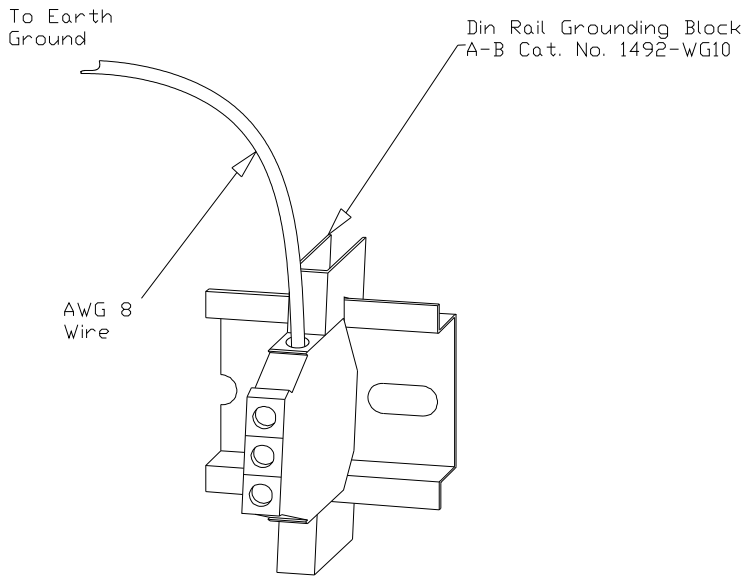
DIN Rail Grounding

ATTENTION

This product is grounded through the DIN rail to chassis ground. Use zinc plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail materials (for example, aluminum or plastic) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding. Secure DIN rail to mounting surface approximately every 200 mm (7.8 in.) and use end-anchors appropriately.

The DIN Rail must be connected to a ground bus or grounding electrode conductor using 8 AWG or 1 inch copper braid. The grounding wire can be connected to the DIN rail using a DIN Rail Grounding Block (Figure 2.2).

Figure 2.2 DIN Rail Grounding Block



Panel/Wall Mount Grounding

The XM modules can also be mounted to a conductive mounting plate that is grounded. See Figure 2.3. Use the grounding screw hole provided on the terminal base to connect the mounting plate to the Functional Earth terminals.

Figure 2.3 Grounding Screw on XM Terminal Base

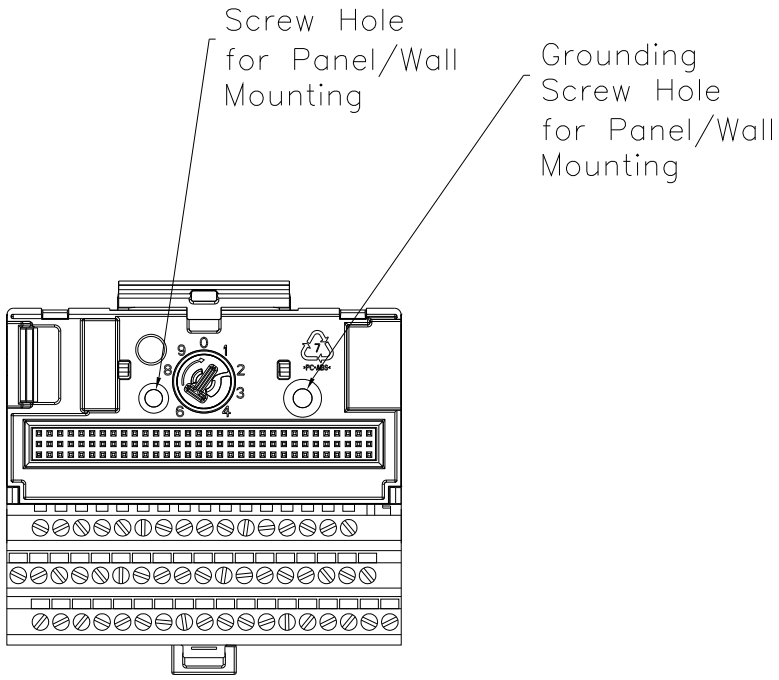
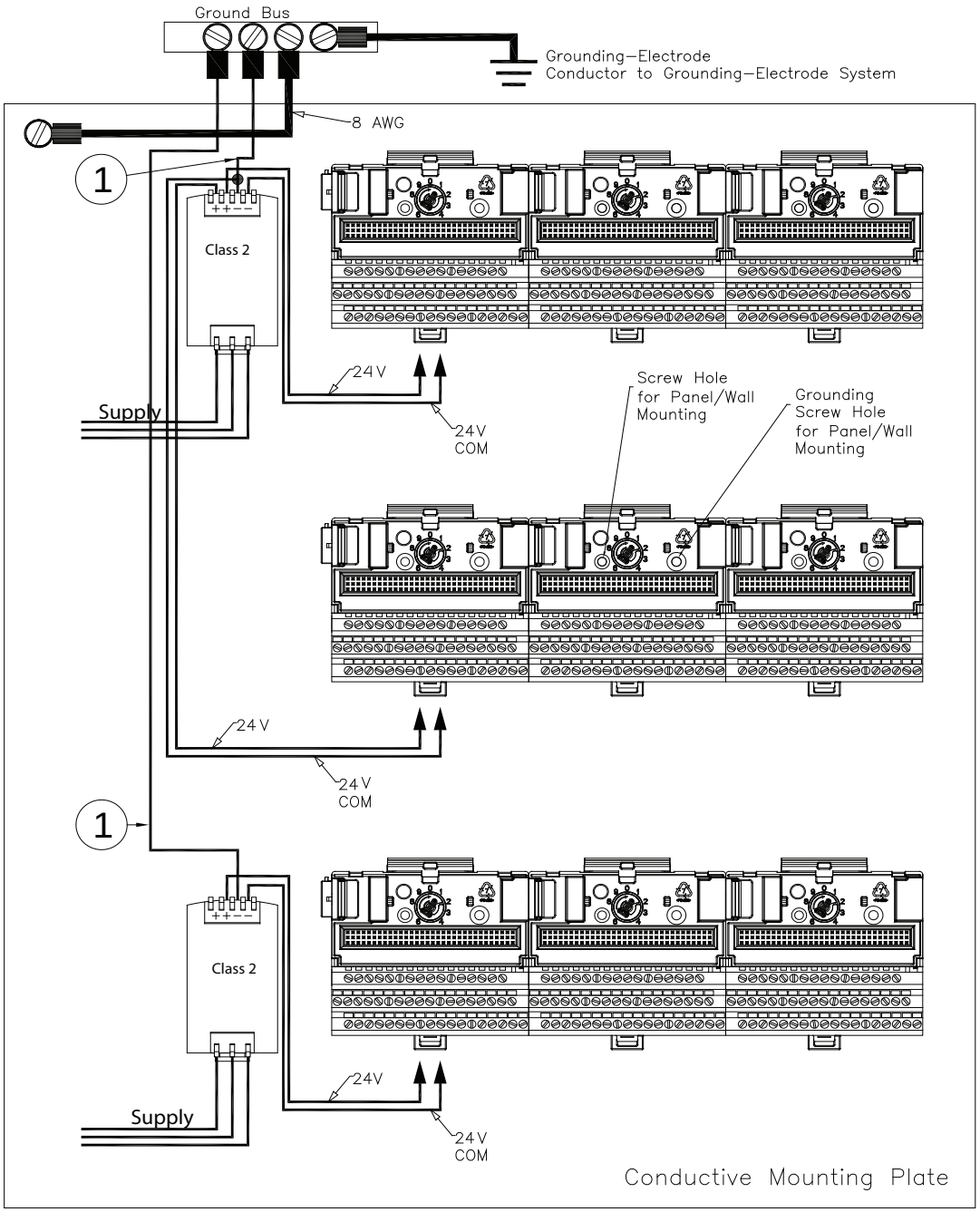


Figure 2.4 Panel/Wall Mount Grounding



1 Use 14 AWG wire. If it is desired to isolate the power supply because of possible ground loops, do not connect 24V Common to earth as illustrated in Figure 2.4.

24V Common Grounding

The XM system is sourced by a single Class 2 power supply. It is recommended that the 24V power to the XM modules is grounded.

Transducer Ground

Make certain the transducers are electrically isolated from earth ground. Cable shields must be grounded at one end of the cable, and the other end left floating or not connected. It is recommended that where possible, the cable shield be grounded at the XM terminal base (Functional Earth terminal) and not at the transducer.

Terminating Resistors

The XM Bus will operate correctly when there is a terminating resistor at each end of the XM Bus.

- Terminating resistors must be 121 ohms, 1%, 1/4 W.
- When installing the XM ControlNet adapter, Cat. No 1440-ACNR, with your XM modules, make sure the adapter is installed at one end of the network. The XM ControlNet adapter has an internal terminating resistor.

  A second terminating resistor is installed across the CAN_High and CAN_Low terminals of the XM module at the other end of the XM network. See Figure 2.1 on page 19.

Mounting the Terminal Base Unit

The XM family includes several different terminal base units to serve all of the XM modules. The 1440-TBS-J terminal base is the only terminal base used with the Dynamic Measurement module (Cat. No. 1440-DYN02-01RJ).

The terminal base can be DIN rail or wall/panel mounted.

WARNING

If you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

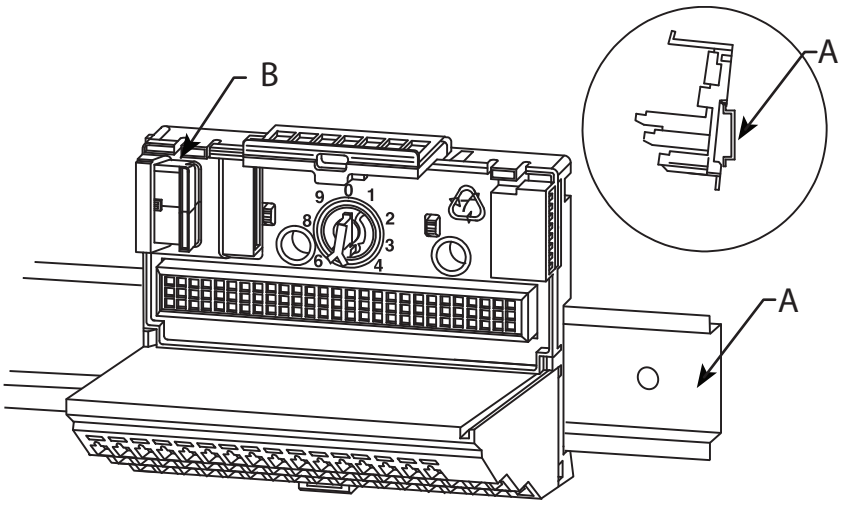
ATTENTION

Do not remove or replace a Terminal Base unit while power is applied. Interruption of the backplane can result in unintentional operation or machine motion.

DIN Rail Mounting

Use the following steps to mount the terminal base unit on a DIN rail (A-B pt no. 199-DR1 or 199-DR4).

1. Position the terminal base on the 35 x 7.5 mm DIN rail (A).

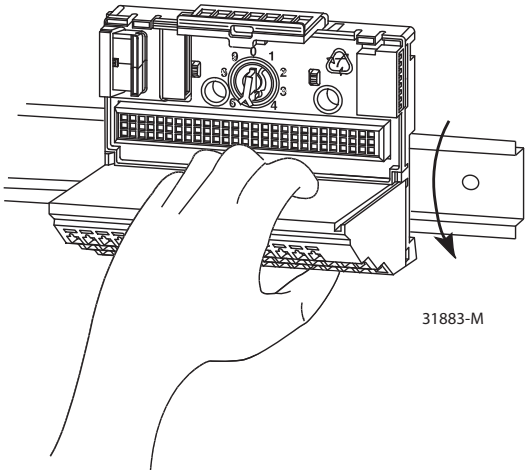


31887-M

Position terminal base at a slight angle and hook over the top of the DIN rail.

2. Slide the terminal base unit over leaving room for the side connector (B).

3. Rotate the terminal base onto the DIN rail with the top of the rail hooked under the lip on the rear of the terminal base.



4. Press down on the terminal base unit to lock the terminal base on the DIN rail.

   If the terminal base does not lock into place, use a screwdriver or similar device to open the locking tab, press down on the terminal base until flush with the DIN rail and release the locking tab to lock the base in place.

Interconnecting Terminal Base Units

Follow the steps below to install another terminal base unit on the DIN rail.

IMPORTANT Terminal base units are mounted left to right on the DIN rail.

1. Position the terminal base on the 35 x 7.5 mm DIN rail (A).

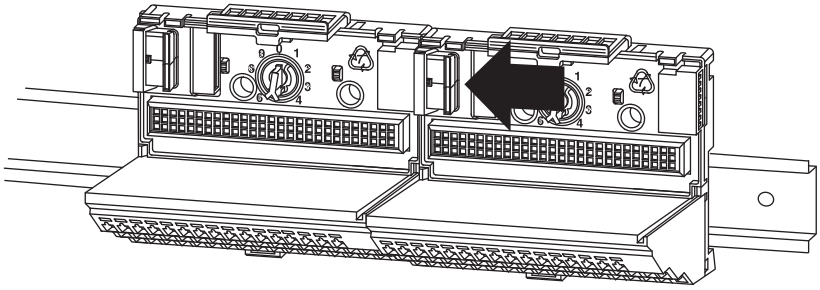
2. Make certain the side connector (B) is **fully retracted** into the base unit.

3. Slide the terminal base unit over tight against the neighboring terminal base. Make sure the hook on the terminal base slides under the edge of the terminal base unit.

4. Press down on the terminal base unit to lock the terminal base on the DIN rail.

   If the terminal base does not lock into place, use a screwdriver or similar device to open the locking tab, press down on the terminal base until flush with the DIN rail and release the locking tab to lock the base in place.

5. Gently push the side connector into the side of the neighboring terminal base to complete the backplane connection.



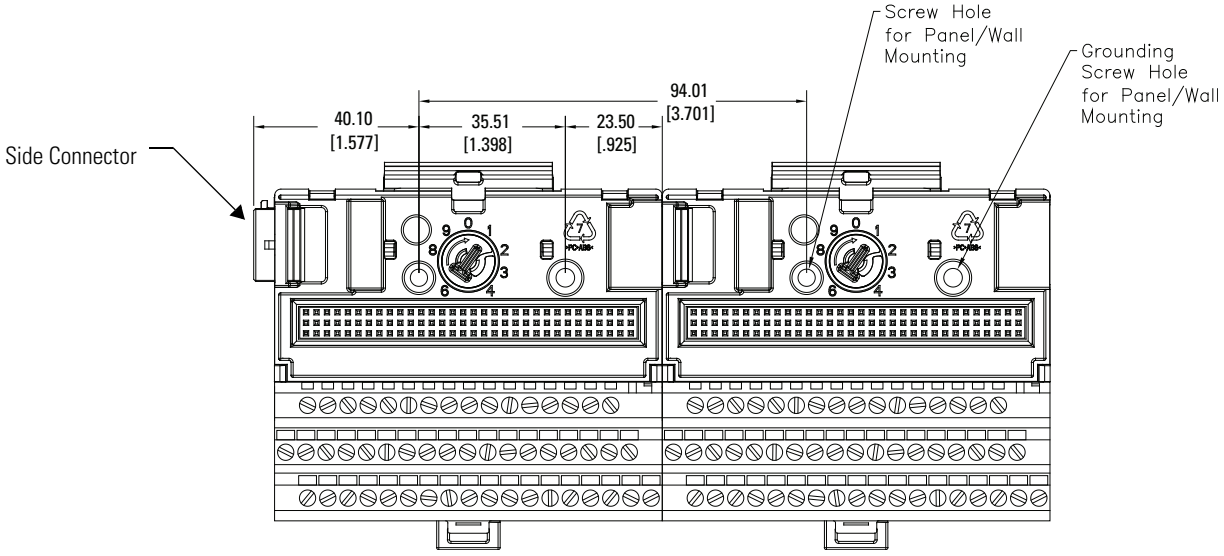
Panel/Wall Mounting

Installation on a wall or panel consists of:

- laying out the drilling points on the wall or panel
- drilling the pilot holes for the mounting screws
- installing the terminal base units and securing them to the wall or panel

Use the following steps to install the terminal base on a wall or panel.

1. Lay out the required points on the wall/panel as shown in the drilling dimension drawing below.

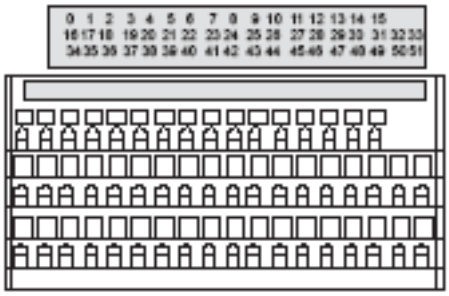


2. Drill the necessary holes for the #6 self-tapping mounting screws.
3. Secure the terminal base unit using two #6 self-tapping screws.
4. To install another terminal base unit, retract the side connector into the base unit. Make sure it is **fully retracted**.
5. Position the terminal base unit up tight against the neighboring terminal base. Make sure the hook on the terminal base slides under the edge of the terminal base unit.
6. Gently push the side connector into the side of the neighboring terminal base to complete the backplane connection.
7. Secure the terminal base to the wall with two #6 self-tapping screws.

Connecting Wiring for Your Module

Wiring to the module is made through the terminal base unit on which the module mounts. The Dynamic Measurement module is compatible only with the 1440-TBS-J terminal base units.

Figure 2.5 1440-TBS-J Terminal Base Unit



Cat. No. 1440-TBS-J

Terminal Block Assignments

The terminal block assignments and descriptions for the Dynamic Measurement module is shown below.

IMPORTANT The terminal block assignments are different for different XM modules. The following table applies only to the 1440-TBS-J terminal base unit. Refer to the installation instructions for the specific XM module for its terminal assignments.

WARNING

If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Terminal Block Assignments

	No.	Name	Description
Channel 0	0	Xducer 0 (+)	Vibration transducer 0 connection
	1	Xducer 0 (-)	Vibration transducer 0 connection
	2	Functional Earth	Connection to DIN rail ground spring or panel mounting hole
	3	Xducer 0 Pwr 24V (-)	Transducer power supply output, negative side; used to power external sensor -24V relative to Signal Common (terminal 41)
	4	Xducer 0 Pwr 24V (+)	Transducer power supply output, positive side; used to power external sensor
	5	Buffer 0 (+)	Vibration signal 0 buffered output
	6	Buffer Output RTN	Vibration buffered output return
	7	Not Connected	

Terminal Block Assignments

	No.	Name	Description
	8	Not Connected	
	9	Functional Earth	Connection to DIN rail ground spring or panel mounting hole
	10	Not Connected	
	11	Not Connected	
	12	Functional Earth	Connection to DIN rail ground spring or panel mounting hole
	13	Not Connected	
	14	Not Connected	
	15	Functional Earth	Connection to DIN rail ground spring or panel mounting hole
Channel 1	16	Xducer 1 (+)	Vibration transducer 1 connection
	17	Xducer 1 (-)	Vibration transducer 1 connection
	18	Functional Earth	Connection to DIN rail ground spring or panel mounting hole
	19	Xducer 1 Pwr 24V (-)	Transducer power supply output, negative side; used to power external sensor; 20 mA maximum load -24V relative to Signal Common (terminal 41)
	20	Xducer 1 Pwr 24V (+)	Transducer power supply output, positive side; used to power external sensor; 20 mA maximum load
	21	Buffer 1 (+)	Vibration signal 1 buffered output
	22	Buffer Output RTN	Vibration buffered output return
	23	Not Connected	
	24	Not Connected	
	25	Functional Earth	Connection to DIN rail ground spring or panel mounting hole
	26	Not Connected	
XM Bus (see page 47 for wiring)	27	CAN_High	XM Bus connection, high differential (white wire)
	28	Shield	bare wire
	29	CAN_Low	XM Bus connection, low differential (blue wire)
	30	XM Bus Common	XM Bus bus power input, negative side (black wire)
	31	Not Connected	
	32	Not Connected	
	33	Not Connected	

Terminal Block Assignments

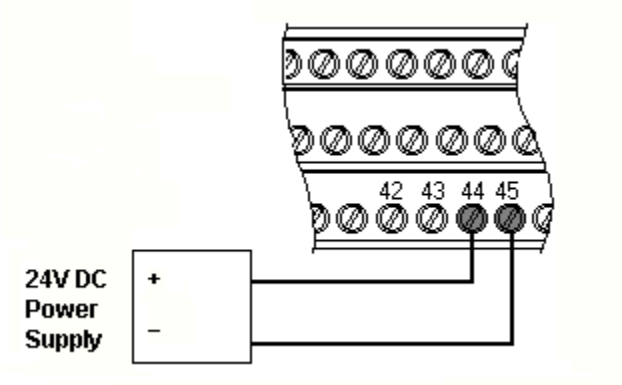
	No.	Name	Description
Tachometer	34	Tach/Signal In (+)	Tachometer transducer/signal input, positive side
	35	Tach/Signal In (-)	Tachometer transducer/signal input, return
	36	Functional Earth	Shield return for Tach/Signal cable Connection to DIN rail ground spring or panel mounting hole
	37	Tachometer 24V (-)	Tachometer power supply output, negative side -24V relative to Signal Common (terminal 41)
	38	Tachometer 24V (+)	Tachometer power supply output, positive side
	39	TACH Buffer	Isolated from terminal 34 by a resistor
	40	Tach/Signal (-)	Return for terminal 39 or connect to terminal 41 for powered Tach transducer when TACH Buffer is not used
	41	Signal Common	
Power	42	Not Connected	
	43	24 V Common	
	44	+24 V In	Connection to external +24V power supply, positive side
	45	24 V Common	Connection to external +24V power supply, negative side (internally DC-coupled to signal ground)
Bussed Tach	46	Tach/Signal Out (-)	Used to daisy chain tachometers Connect to terminal 45 or 41 for a powered Tach transducer (left most module only)
	47	Tach/Signal Out (+)	Used to daisy chain tachometer to additional terminal bases Connect daisy chain to terminal 34 of next terminal base
	48	Tach/Signal Out (-)	Used to daisy chain tachometer Connect daisy chain to terminal 35 of next terminal base
	49	Not Connected	
	50	Not Connected	
	51	Not Connected	

Connecting the Power Supply

The power supply to the module is nominally 24V DC. The Class 2 power supply connection provides power to the device and other XM modules located on the DIN rail.

When wiring the DC input power supply to the terminal base unit, connection may be made as shown in Figure 2.6. Also refer to Figure 2.1 on page 19.

Figure 2.6 DC Input Power Supply Connections



IMPORTANT The power connection is different for different XM modules. Refer to the installation instructions for your specific XM module for complete wiring information.

Connecting the Tachometer Signal

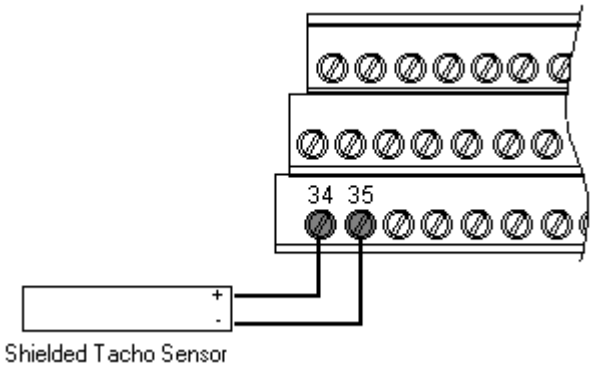
The Dynamic Measurement module provides a single tachometer input signal. The signal processing performed on the tachometer signal depends on the configuration of the module. See Configure the Tachometer Properties on page 68 for a description of the tachometer parameters.

IMPORTANT If you are not using the tachometer input, set the **Pulses per Revolution** parameter to zero (0). This will disable the tachometer measurement and prevent the module from indicating a tachometer fault (TACH indicator flashing yellow). A tachometer fault occurs when no signal pulses are received on the tachometer input signal for a relatively long period.

Connecting a Magnetic Pickup Tachometer

Figure 2.7 shows the wiring of a magnetic pickup tachometer to the terminal base unit.

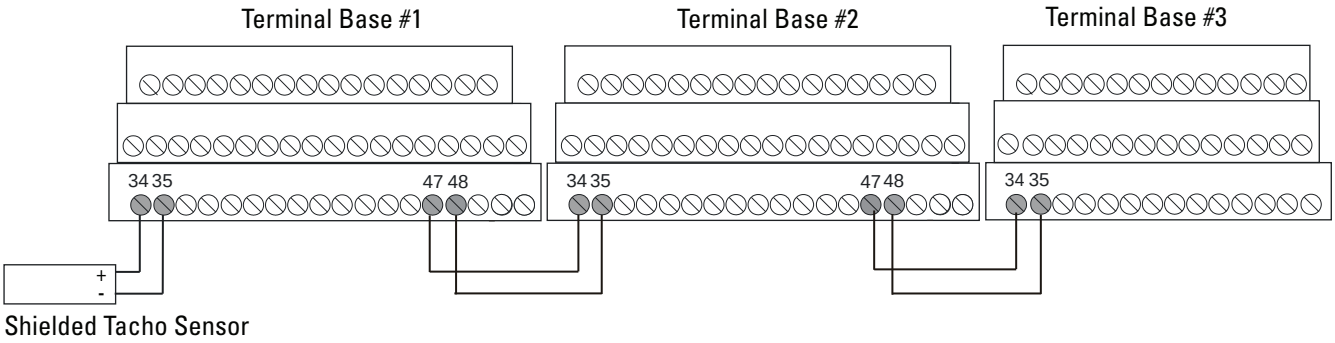
Figure 2.7 Magnetic Pickup Tachometer Signal Connection



Daisy Chain Tachometer Connection

Figure 2.8 shows the daisy chain wiring of a tachometer to multiple terminal base units.

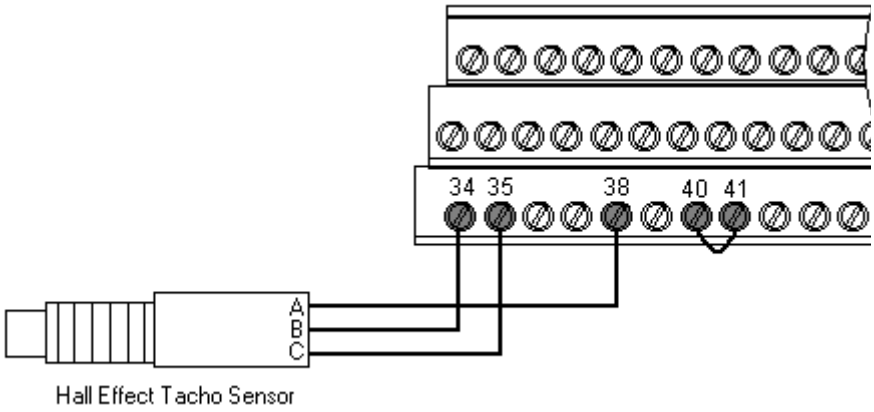
Figure 2.8 Daisy Chain Tachometer Connection



Connecting a Hall Effect Tachometer Sensor

Figure 2.9 shows the wiring of a Hall Effect Tachometer Sensor, Cat. No. EK-44395, to the terminal base unit.

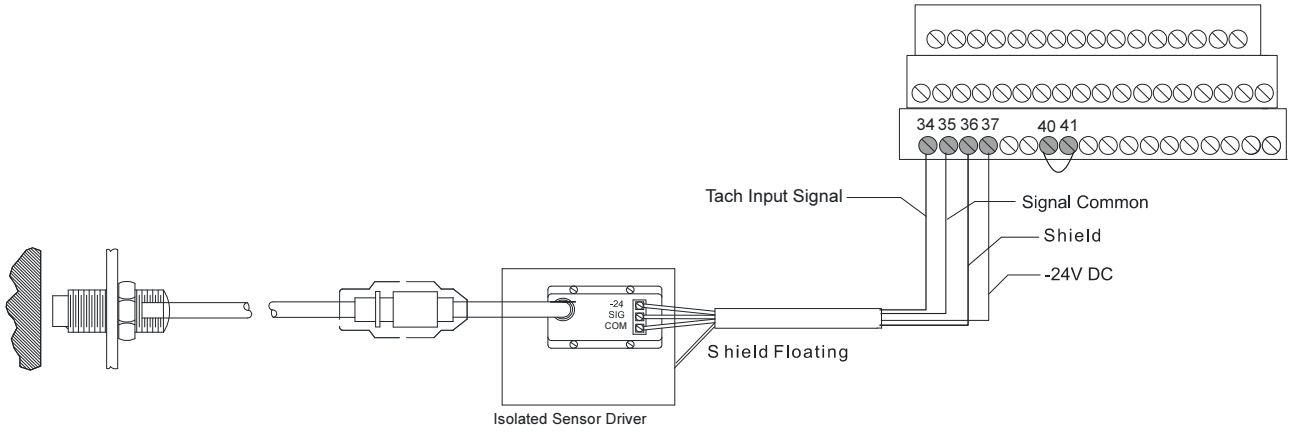
Figure 2.9 Hall Effect Tachometer Signal Connection



Connecting a Non-contact Sensor to the Tachometer Signal

Figure 2.10 shows the wiring of a non-contact sensor to the tachometer input signal.

Figure 2.10 Non-Contact Sensor to Tachometer Signal Connection

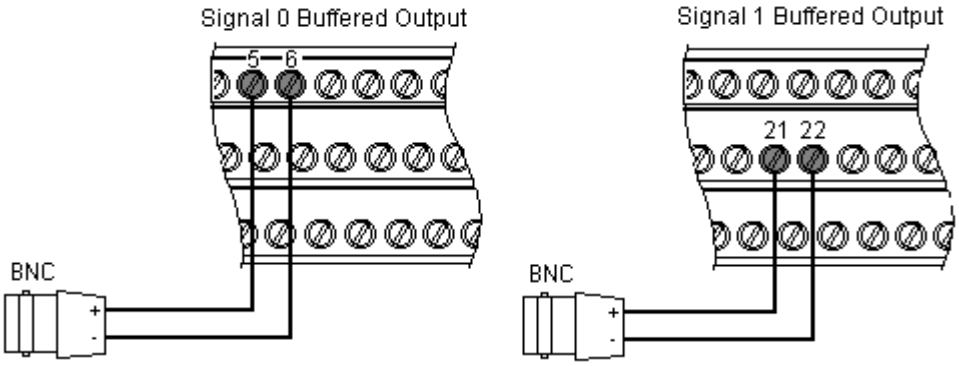


Connecting the Buffered Outputs

The Dynamic Measurement module provides buffered outputs of all transducer input signals. The buffered output connections may be used to connect the module to portable data collectors or other online systems.

Figure 2.11 shows the buffered output connections for the module.

Figure 2.11 Buffered Output Connections



Connecting the Transducer

The module can accept input from any Allen-Bradley non-contact eddy current probe, a standard IEPE accelerometer, a velocity transducer, AC voltage output, or a DC voltage output measurement device.

Connecting an IEPE Accelerometer

The following figures show the wiring of an IEPE accelerometer to the terminal base unit.

ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

IMPORTANT

Make certain the **Power** parameter is set to IEPE so power is provided to the transducer. See Configure the Channel Properties on page 64 for details.

Figure 2.12 IEPE Accelerometer to Channel 0 Wiring

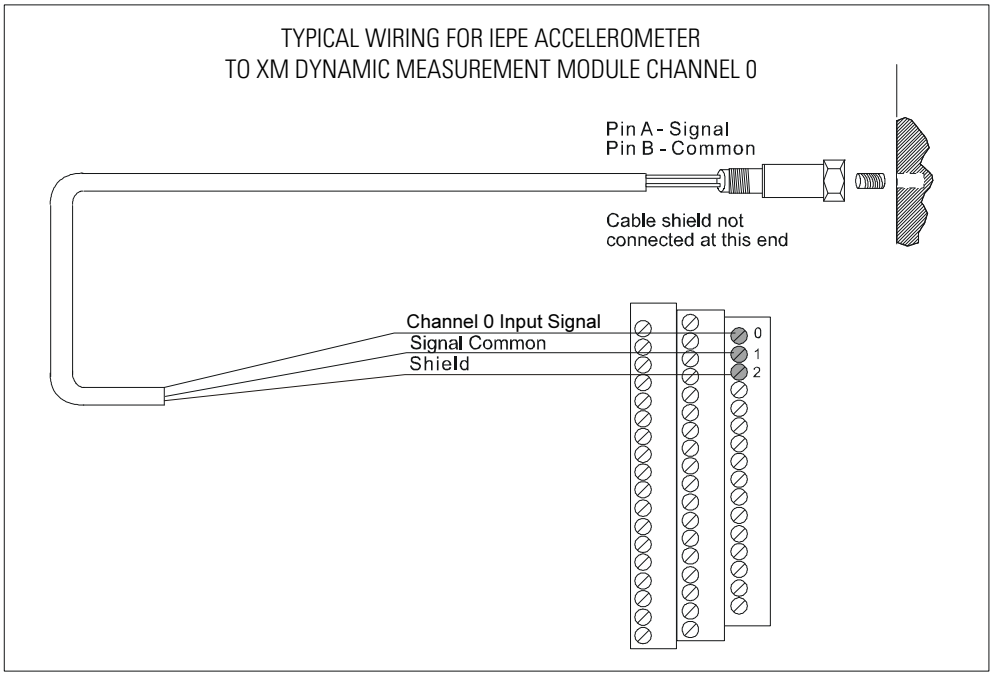
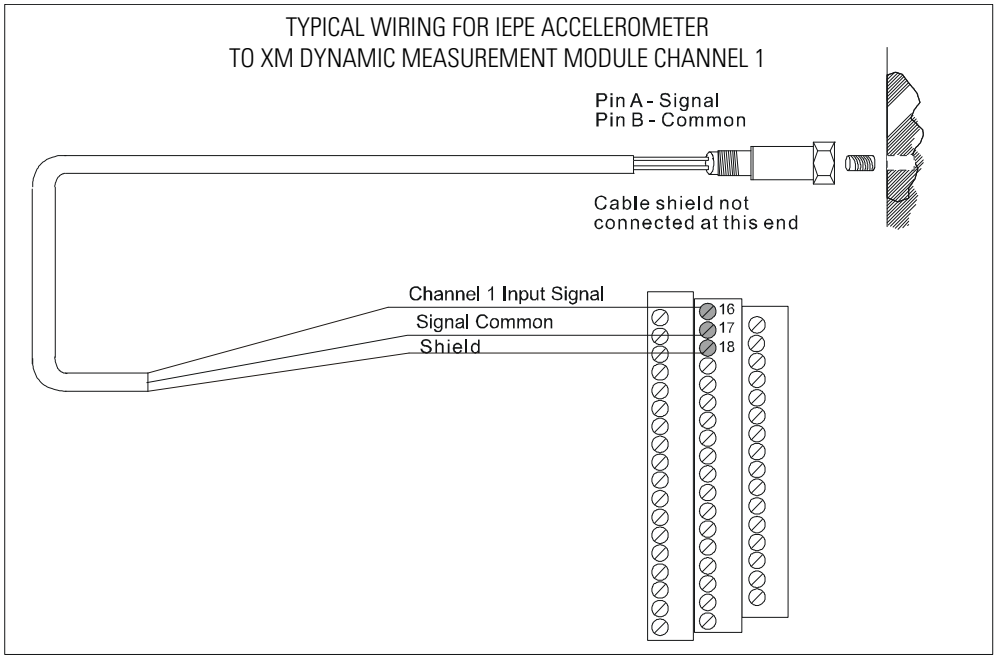


Figure 2.13 IEPE Accelerometer to Channel 1 Wiring



Connecting a Non-contact Sensor

The following figures show the wiring of a non-contact sensor to the terminal base unit.

ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

IMPORTANT

Make certain the **Power** parameter is set to -24V to set the buffered outputs to the appropriate range. See Configure the Channel Properties on page 64 for details.

Figure 2.14 Non-contact Sensor to Channel 0 Wiring

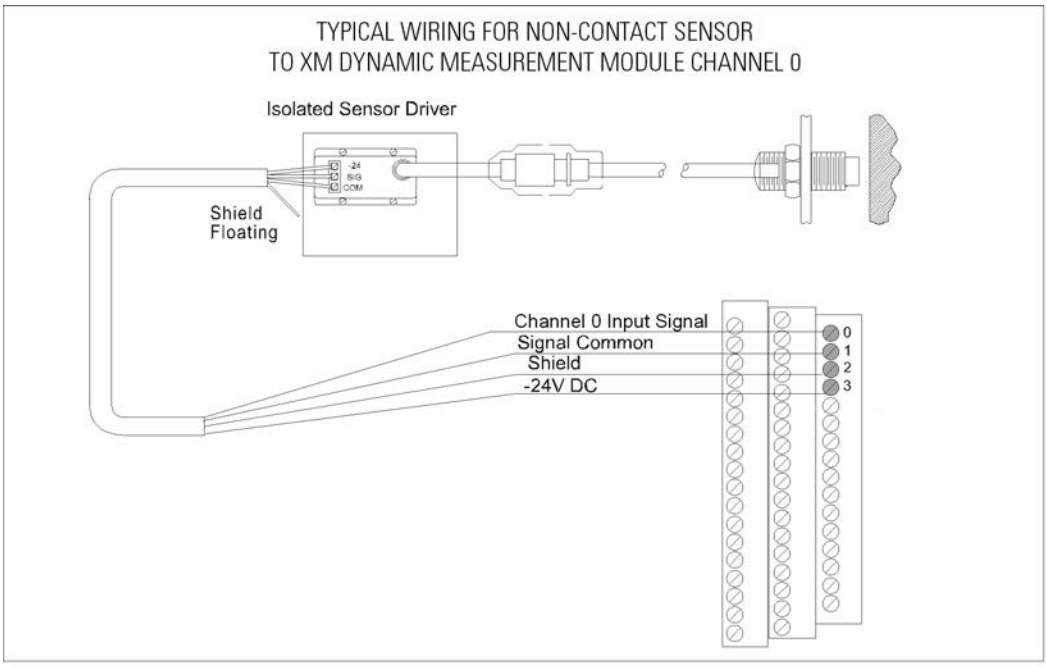
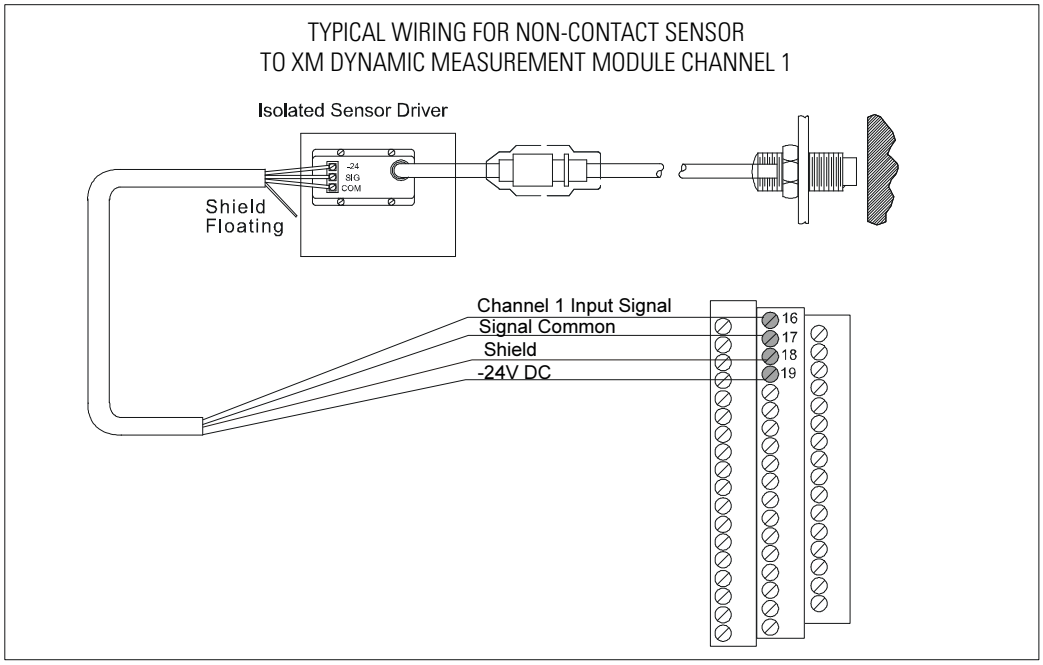


Figure 2.15 Non-contact Sensor to Channel 1 Wiring



Connecting a Passive Transducer

The following figures show the wiring of a passive transducer, such as a velocity sensor, to the terminal base unit.

ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

IMPORTANT

The module does not power the sensor. It measures only the input voltage.

IMPORTANT

Make certain the **Power** parameter is set to Bias Current. See Configure the Channel Properties on page 64 for details.

Figure 2.16 Velocity Sensor to Channel 0 Wiring

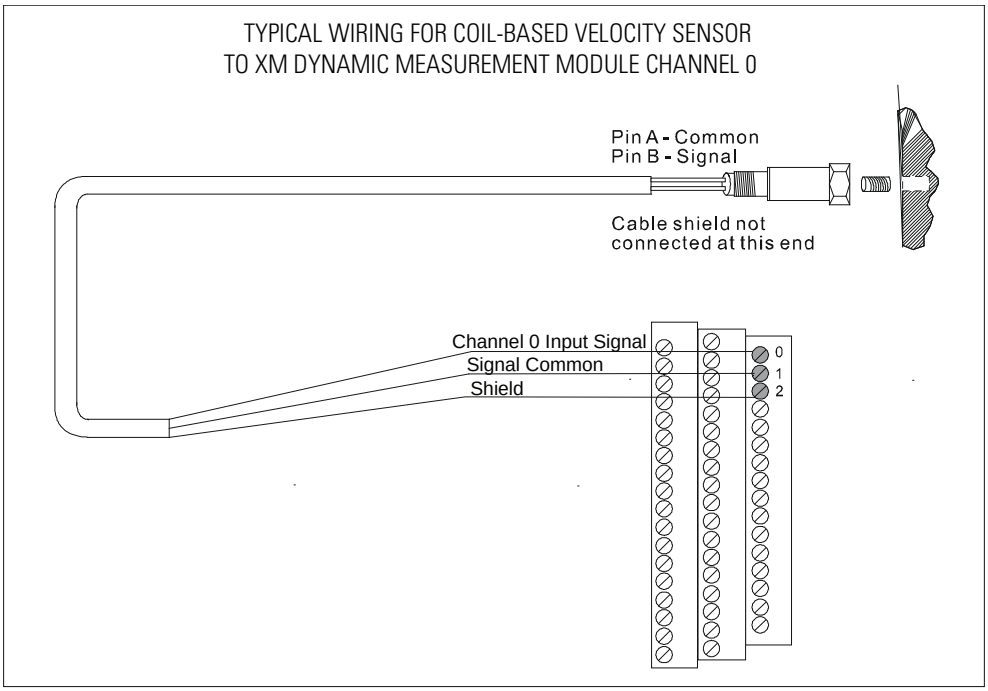
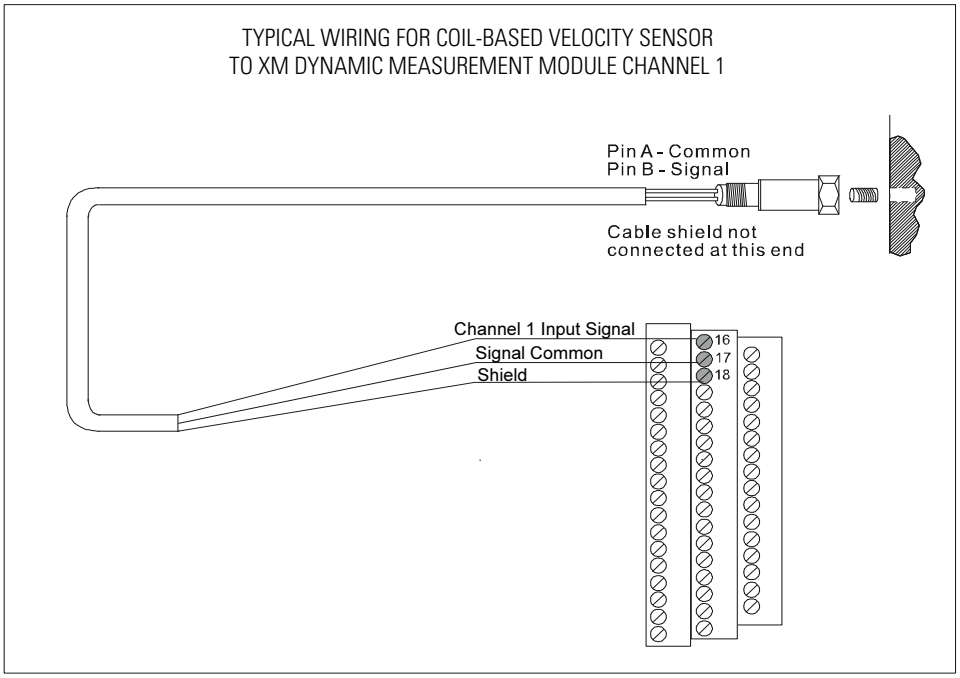


Figure 2.17 Velocity Sensor to Channel 1 Wiring



Connecting a Powered Sensor

The following figures show the wiring of a powered sensor, such as the Model 580 Vibration Pickup, to the terminal base unit.

ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

IMPORTANT

Make certain the **Power** parameter is set to +24V so power is provided to the transducer. See Configure the Channel Properties on page 64 for details.

Figure 2.18 Powered Sensor to Channel 0 Wiring

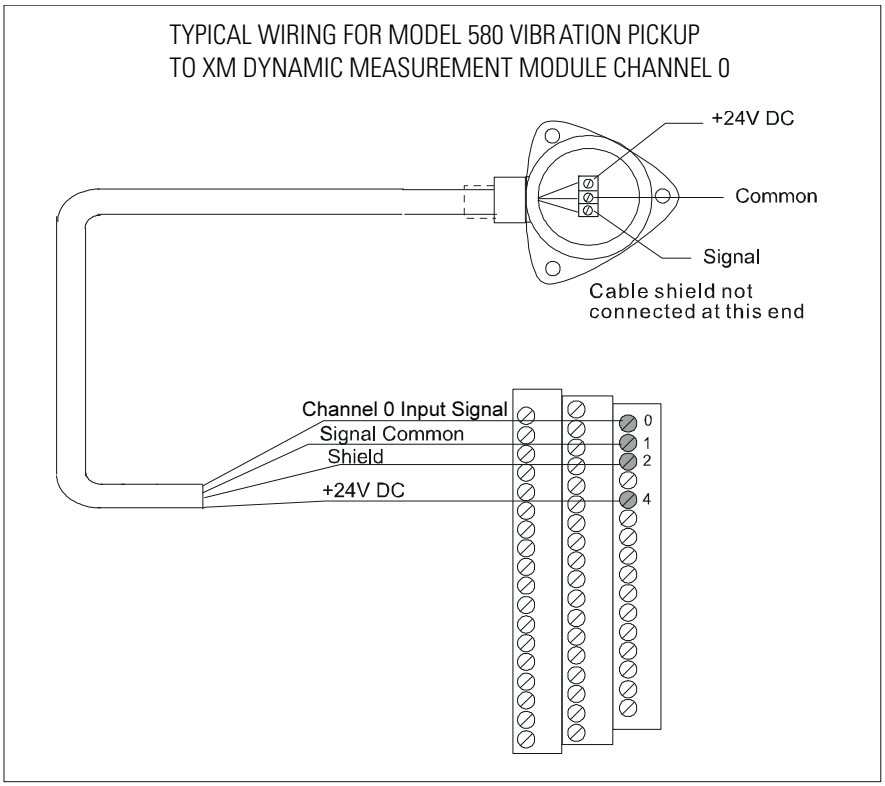
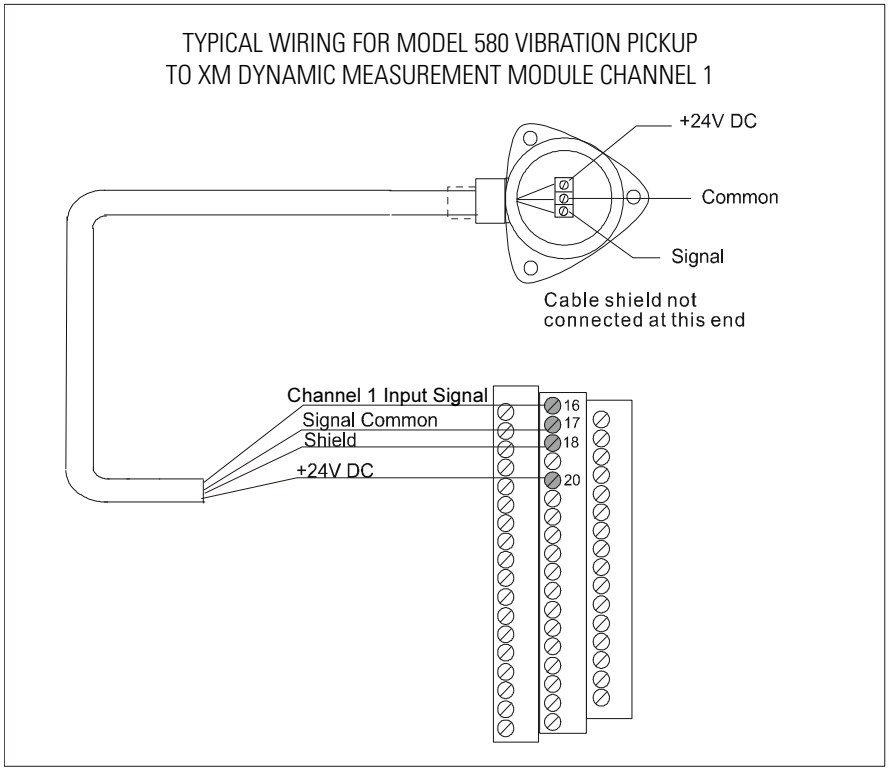


Figure 2.19 Powered Sensor to Channel 1 Wiring



Connecting a Process DC Voltage Signal

The following figures show the wiring from a process DC voltage signal to the terminal base unit.

ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

IMPORTANT

The module does not power the sensor. It measures only the input voltage. Make certain the **Power** parameter is set to None. See Configure the Channel Properties on page 64 for details.

Figure 2.20 DC Voltage Signal to Channel 0 Wiring

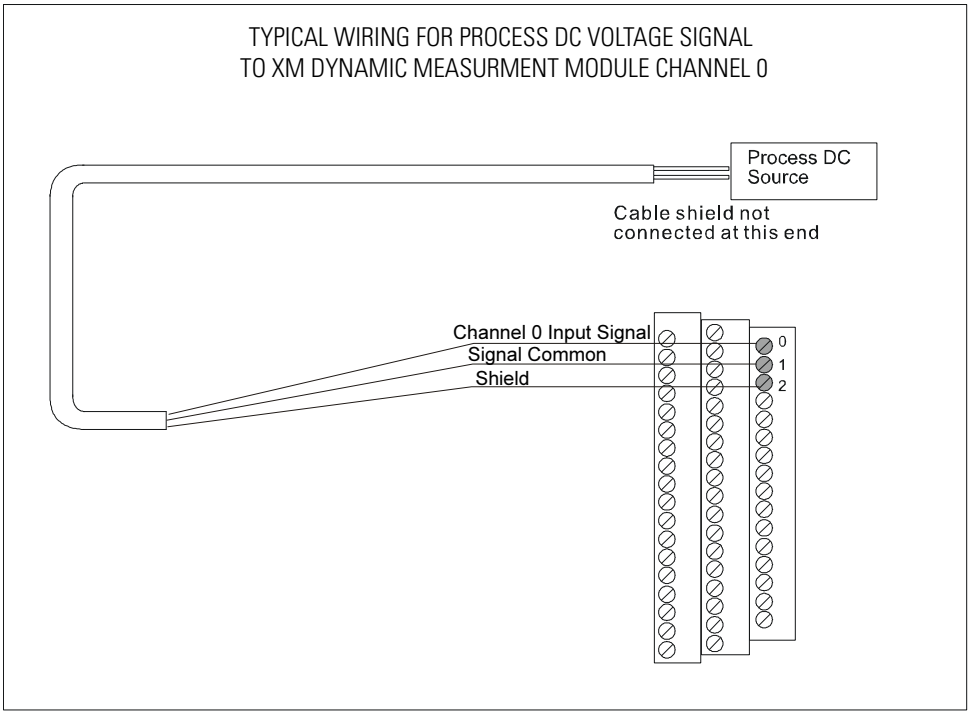
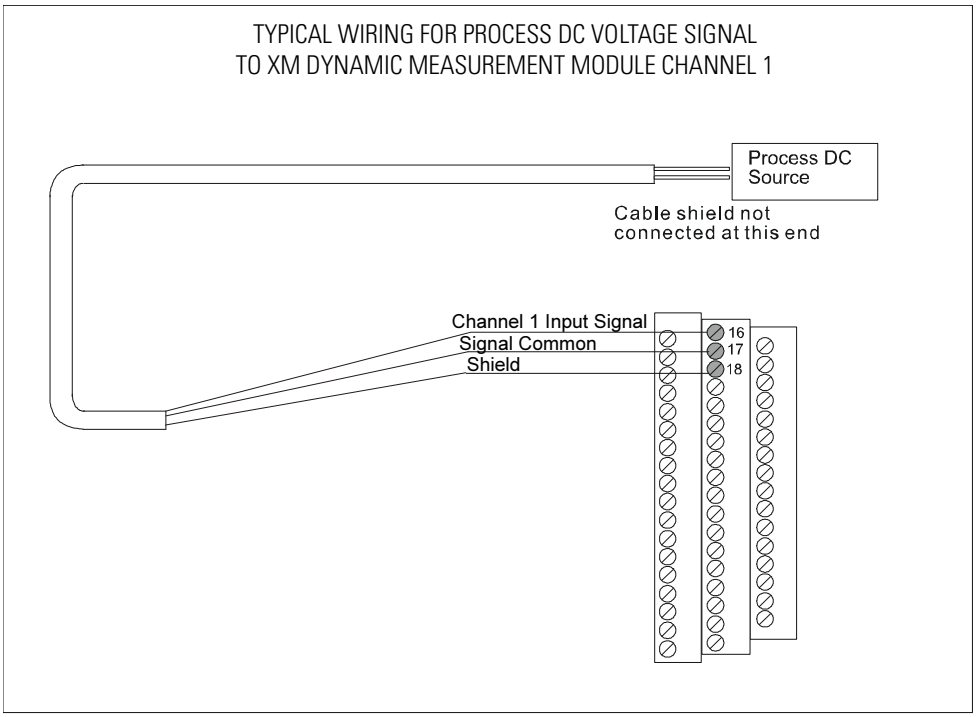


Figure 2.21 DC Voltage Signal to Channel 1 Wiring



Connecting an IEPE Accelerometer and Non-Contact Sensor

The following figure shows the wiring of an IEPE accelerometer to channel 0 and the wiring of a non-contact sensor to channel 1.

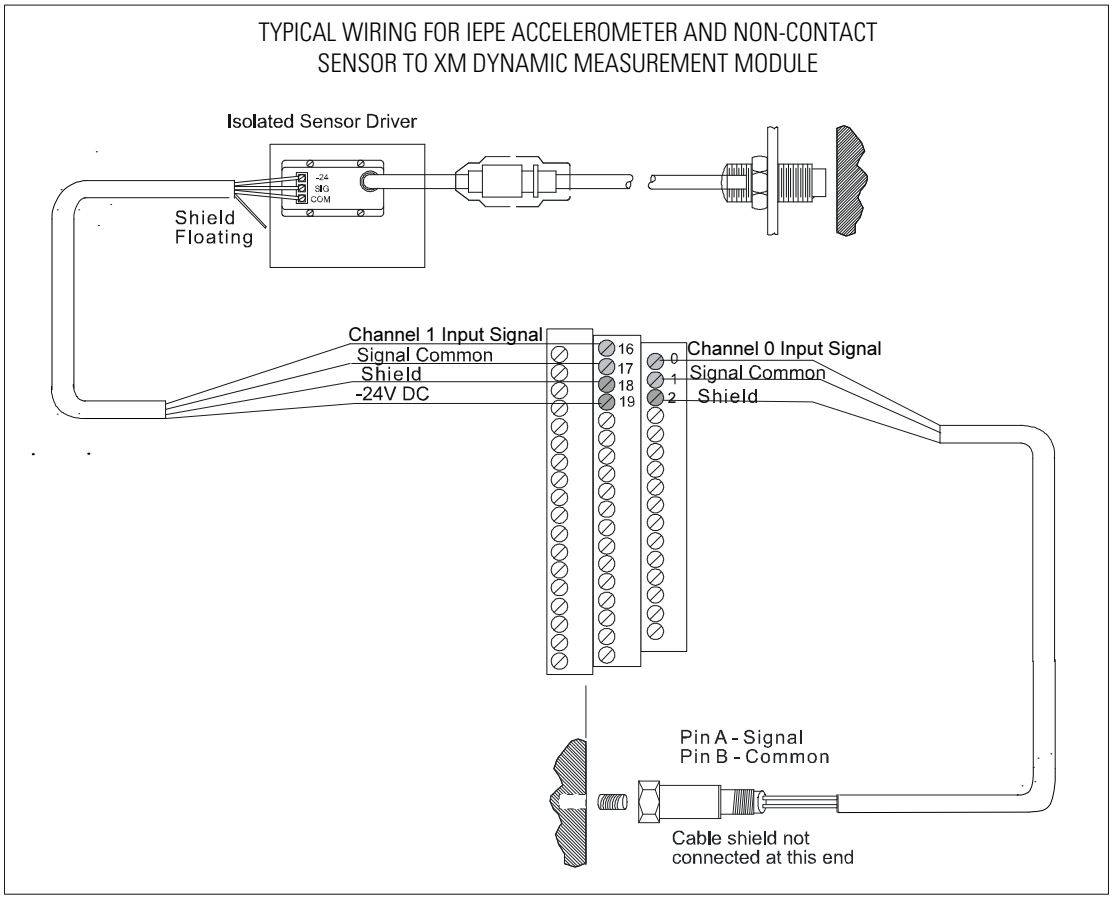
ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

IMPORTANT

Make certain the **Power** parameter for each channel is set correctly. Set channel 0 **Power** to IEPE and set channel 1 **Power** to -24V. See Configure the Channel Properties on page 64 for details.

Figure 2.22 IEPE Accelerometer and Non-Contact Sensor Wiring



Connecting Two Accelerometers and a Non-Contact Sensor

The following figure shows the wiring of two IEPE accelerometers and a non-contact sensor to the terminal base. The IEPE accelerometers are wired to channel 0 and channel 1. The non-contact sensor is wired to the tachometer input signal.

ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

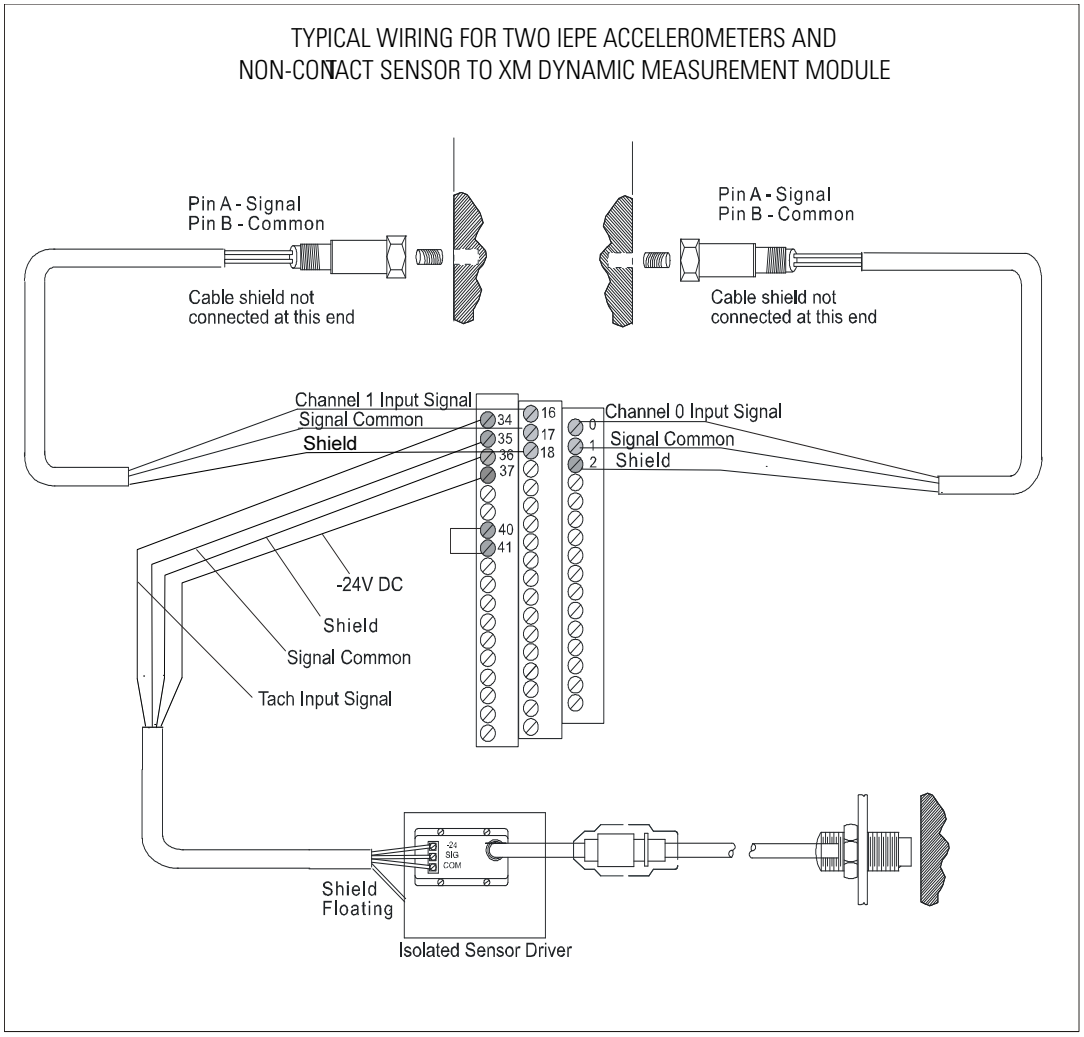
IMPORTANT

Make certain the **Power** parameter is set to IEPE for both channel 0 and channel 1 so power is provided to the accelerometers. See Configure the Channel Properties on page 64 for details.

IMPORTANT

Transducer DC bias is monitored on all signals.

Figure 2.23 Two IEPE Accelerometers and a Non-Contact Sensor Wiring



Connecting a Velocity Sensor and Two Non-Contact Sensors

The following figure shows the wiring of a velocity sensor and two non-contact sensors to the terminal base unit. The first non-contact sensor is wired to channel 0. The velocity sensor is wired to channel 1, and the other non-contact sensor is wired to the tachometer input signal.

ATTENTION

You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

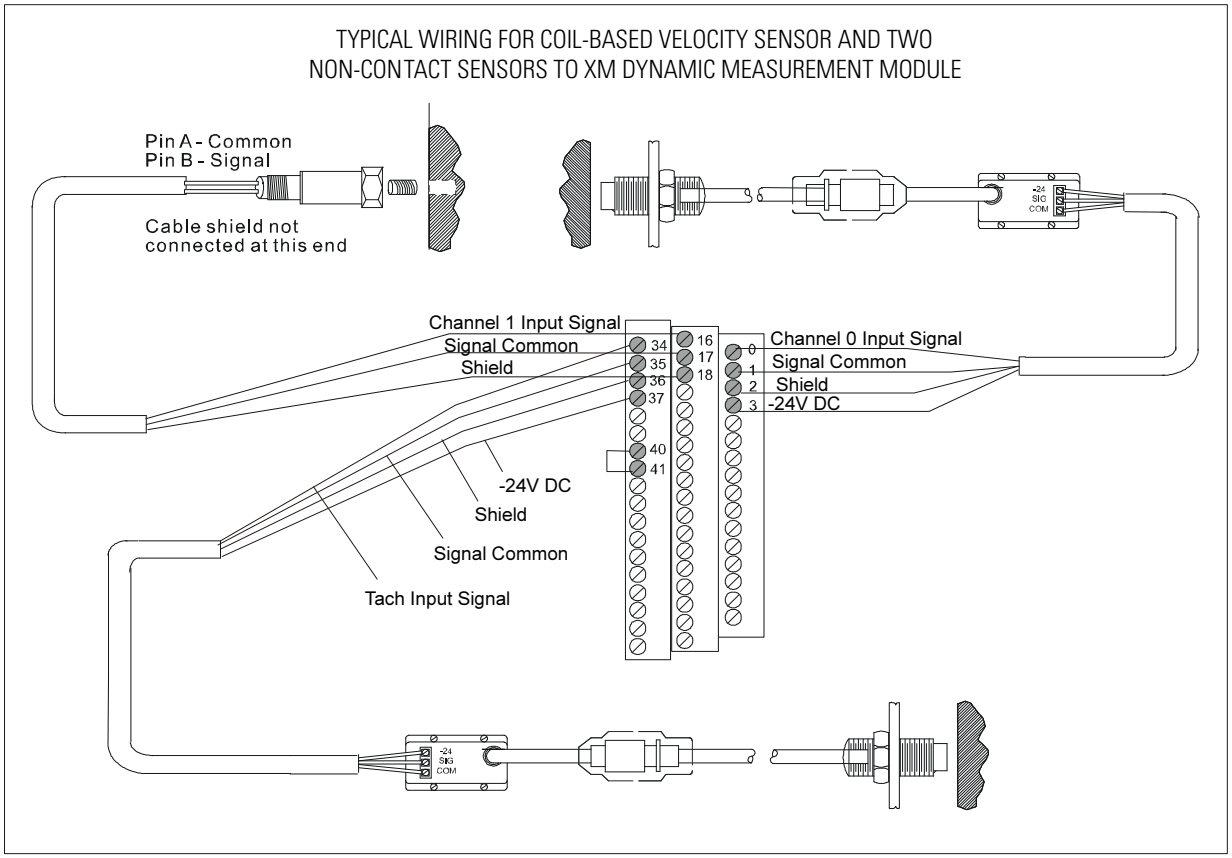
IMPORTANT

Transducer DC bias is monitored on all signals.

IMPORTANT

Make certain the **Power** parameter is set correctly for each channel. Set channel 0 **Power** to -24V and set channel 1 **Power** to Bias Current. See Configure the Channel Properties on page 64 for details.

Figure 2.24 Velocity Sensor and Two Non-contact Sensor Wiring



Connecting Three Non-contact Sensors

The following figure shows the wiring of three non-contact sensors to the terminal base unit. One non-contact sensor is wired to channel 0. The second non-contact sensor is wired to channel 1, and the other non-contact sensor is wired to the tachometer input signal.

ATTENTION

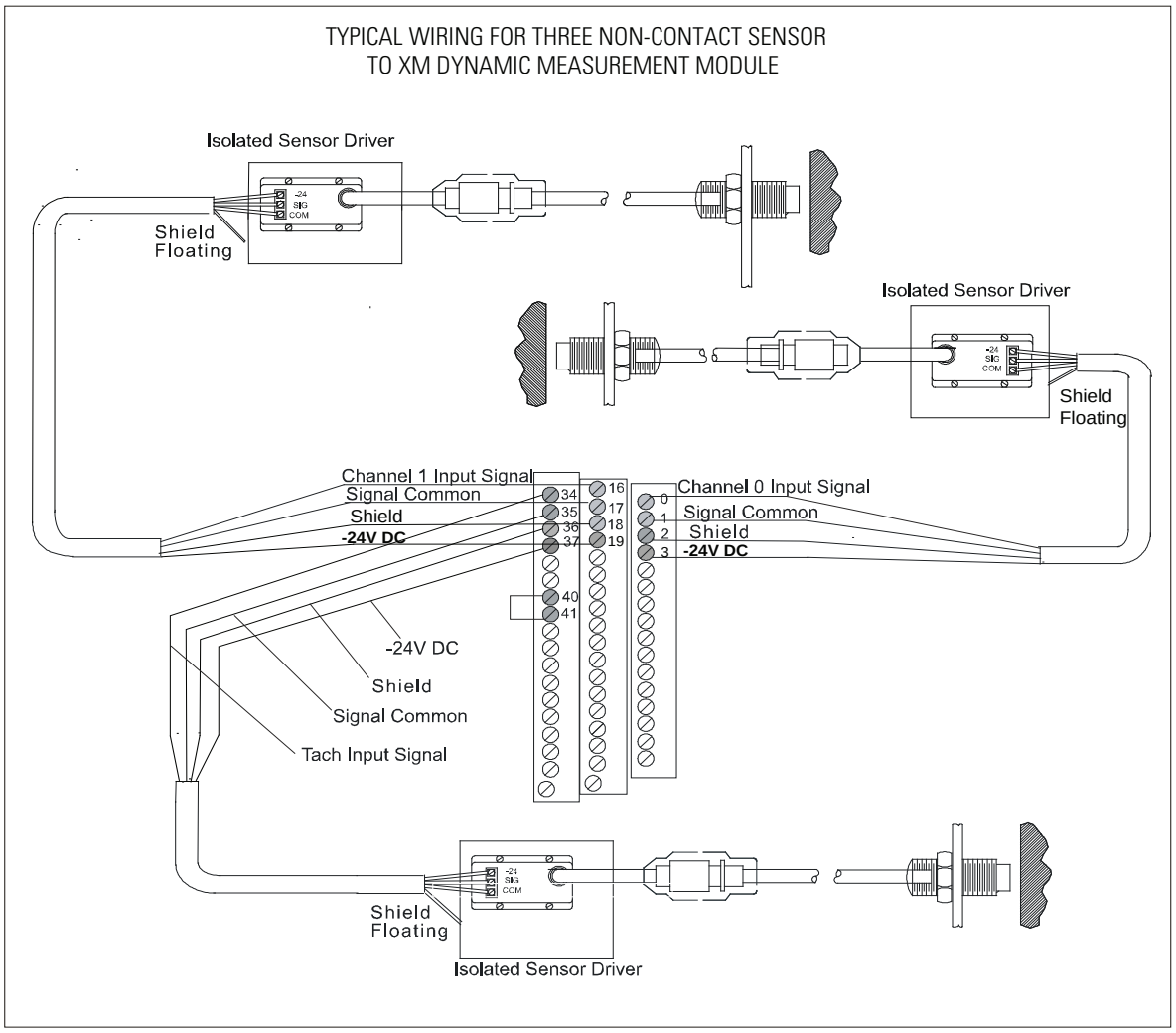
You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Functional Earth terminal may be used. See Terminal Block Assignments on page 28.

IMPORTANT

Transducer DC bias is monitored on all signals.

IMPORTANT Make certain the **Power** parameter is set to -24V for both channel 0 and channel 1 to set the buffered outputs to the appropriate range. See Configure the Channel Properties on page 64 for details.

Figure 2.25 Three Non-contact Sensors Wiring



XM Bus Connection

The module includes an XM Bus connection that allows the module to communicate with a Programmable Logic Controller (PLC), Distributed Control System (DCS), or another XM module.

The XM Bus communicates using standard DeviceNet protocols but it does not share the same specifications for the media (the wire) and isolation characteristics.

Connect the DeviceNet cable to the terminal base unit as shown.

Connect	To	Terminal
White Wire	CAN_High	27
Bare Wire	Shield	28
Blue Wire	CAN_Low	29
Black Wire	XM Bus Common	30

ATTENTION

You must ground the shield at only one location. Connecting the shield to terminal 28 will ground the shield at the XM module. If you intend to terminate the shield elsewhere, do not connect the shield to terminal 28.

IMPORTANT

If the XM module is the first or last device connected to the DeviceNet network, be sure to add a terminating resistor (121 ohms, 1%, 1/4W resistor) across the CAN High and CAN Low wires. See Terminating Resistors on page 23.

The device is shipped from the factory with the XM Bus node address set to 63. The XM Bus node address is set using the DIP switches that are located on the top of the module. See Set the Node Address on page 50.

IMPORTANT

The baud rate for the Dynamic Measurement module is set by way of "baud detection" (Autobaud) at power-up.

When connecting the XM network from one rail of XM modules to another rail of XM modules, consider the following:

- CAN_High, CAN_Low, and XM Bus Common must be connected.
- The XM network must be terminated on either end with a 121 ohm, 1% 1/4 W terminating resistor. Note that the 1440-ACNR has an internal terminating resistor. See Figure 2.1 on page 19.

Mounting the Module

The Dynamic Measurement module mounts on a terminal base unit (1440-TBS-J). We recommend that you insert the module after you have connected the wiring on the terminal base unit.

ATTENTION

The Dynamic Measurement module is compatible only with the 1440-TBS-J terminal base unit. The keyswitch on the terminal base unit should be at position 1 for the modules.

Do not attempt to install 1440-DYN02-01RJ module on other terminal base units.

Do not change the position of the keyswitch after wiring the terminal base.

WARNING

If you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

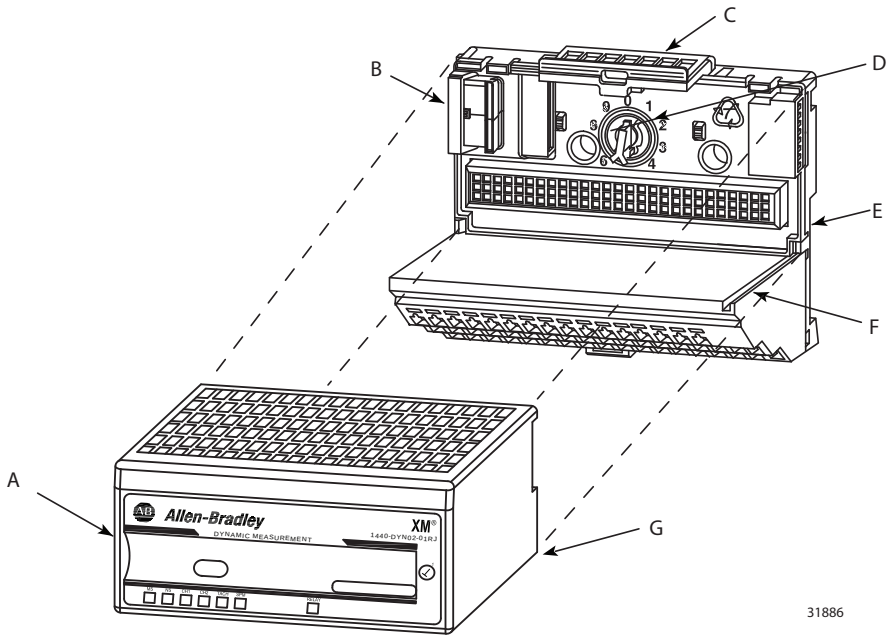
WARNING

If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

IMPORTANT

Install the overlay slide label to protect serial connector and electronics when the serial port is not in use.

1. Make certain the keyswitch (D) on the terminal base unit (E) is at position 1 as required for the module.



2. Make certain the side connector (B) is pushed all the way to the left. **You cannot install the module unless the connector is fully extended**.

3. Make sure that the pins on the bottom of the module are straight so they will align properly with the connector in the terminal base unit.

4. Position the module (A) with its alignment bar (G) aligned with the groove (F) on the terminal base.

5. Press firmly and evenly to seat the module in the terminal base unit. The module is seated when the latching mechanism (C) is locked into the module.

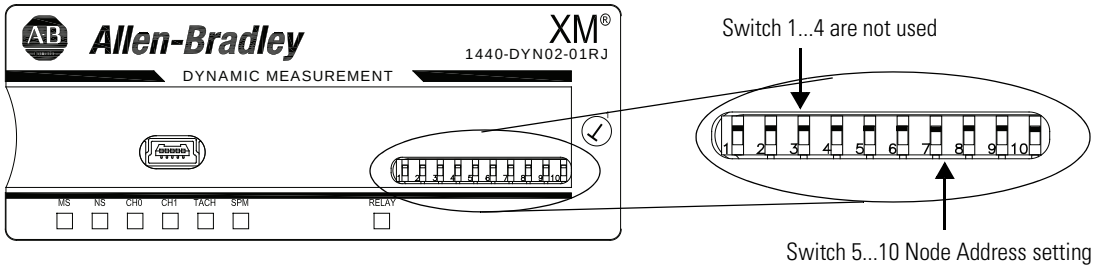
6. Repeat the above steps to install the next module in its terminal base.

Basic Operations

Set the Node Address

The module has a DIP switch for setting the XM Bus node address. DIP switches 5 through 10 set the module's node address using binary addressing.

The module is shipped from the factory with the node address set to 63 (as shown below).

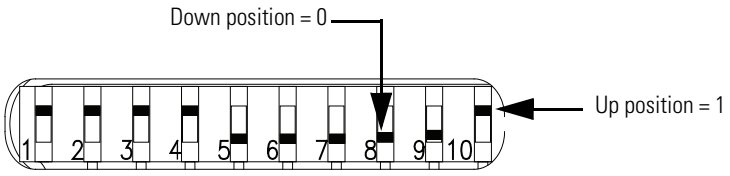


TIP The node addresses start with 1 for the module closest to the ACNR, and increase for each consecutive module.

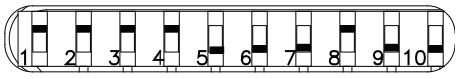
Follow the steps below to set the node address.

1. Refer to XM Bus Node Address table on page 52 for the switch settings of a specific address.

2. Using a pointed tool, slide switches 5 through 10 to the appropriate positions (1 or 0).



EXAMPLE If you want the node address to be 4 then you would set dip switches 5...8 as follows.



Switch Settings for the XM Bus Node Address

Node Addr	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	Node Addr	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10
0[1]	Not Used	Not Used	Not Used	Not Used	0	0	0	0	0	0	**32**	Not Used	Not Used	Not Used	Not Used	1	0	0	0	0	0
1					0	0	0	0	0	1	**33**					1	0	0	0	0	1
2					0	0	0	0	1	0	**34**					1	0	0	0	1	0
3					0	0	0	0	1	1	**35**					1	0	0	0	1	1
4					0	0	0	1	0	0	**36**					1	0	0	1	0	0
5					0	0	0	1	0	1	**37**					1	0	0	1	0	1
6					0	0	0	1	1	0	**38**					1	0	0	1	1	0
7					0	0	0	1	1	1	**39**					1	0	0	1	1	1
8					0	0	1	0	0	0	**40**					1	0	1	0	0	0
9					0	0	1	0	0	1	**41**					1	0	1	0	0	1
10					0	0	1	0	1	0	**42**					1	0	1	0	1	0
11					0	0	1	0	1	1	**43**					1	0	1	0	1	1
12					0	0	1	1	0	0	**44**					1	0	1	1	0	0
13					0	0	1	1	0	1	**45**					1	0	1	1	0	1
14					0	0	1	1	1	0	**46**					1	0	1	1	1	0
15					0	0	1	1	1	1	**47**					1	0	1	1	1	1
16					0	1	0	0	0	0	**48**					1	1	0	0	0	0
17					0	1	0	0	0	1	**49**					1	1	0	0	0	1
18					0	1	0	0	1	0	**50**					1	1	0	0	1	0
19					0	1	0	0	1	1	**51**					1	1	0	0	1	1
20					0	1	0	1	0	0	**52**					1	1	0	1	0	0
21					0	1	0	1	0	1	**53**					1	1	0	1	0	1
22					0	1	0	1	1	0	**54**					1	1	0	1	1	0
23					0	1	0	1	1	1	**55**					1	1	0	1	1	1
24					0	1	1	0	0	0	**56**					1	1	1	0	0	0
25					0	1	1	0	0	1	**57**					1	1	1	0	0	1
26					0	1	1	0	1	0	**58**					1	1	1	0	1	0
27					0	1	1	0	1	1	**59**					1	1	1	0	1	1
28					0	1	1	1	0	0	**60**					1	1	1	1	0	0
29					0	1	1	1	0	1	**61**					1	1	1	1	0	1
30					0	1	1	1	1	0	**62**					1	1	1	1	1	0
31					0	1	1	1	1	1	**63**					1	1	1	1	1	1

(1) Do not set the node address to 0. Node addresses start with 1 for the module closest to the ACNR.

Power Up the Module

The module performs a self-test at power-up. The self-test includes an LED test and a device test. During the LED test, the indicators will be turned on independently and in sequence for approximately 0.25 second.

The device test occurs after the LED test. The Module Status (MS) indicator is used to indicate the status of the device self-test.

MS Indicator State	Description
Flashing Red and Green	Device self-test is in progress.
Solid Green or Flashing Green	Device self-test completed successfully, and the firmware is valid and running.
Flashing Red	Device self-test completed, the hardware is OK, but the firmware is invalid. Or, the firmware download is in progress.
Solid Red	Unrecoverable fault, hardware failure, or Boot Loader program may be corrupted.

See Troubleshoot the Module on page 87 for more information about the LED indicators.

Configure the Module

The module can be configured using the RSLogix™ 5000 software (Version 16.0 or later) Add-on Profile (AOP) and a 1440-ACNR ControlNet adapter. See Configure XM Module in RSLogix 5000 Software on page 55.

Notes:

Configure XM Module in RSLogix 5000 Software

The RSLogix 5000 software Add-on Profile (AOP) lets you set up I/O connections to your controller and configure the XM module. Read this chapter for information about how to configure the 1440-DYN02-01RJ module, using RSLogix 5000 software (Version 16 or later) and the 1440-ACNR ControlNet Adapter.

Topic	Page
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Add the XM Module to the I/O Configuration Tree	56
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Access Module Data using the ACNR	84

For more information about the ControlNet network, refer to ControlNet Modules in Logix5000 Systems™, publication CNET-UM001.

Use the Help Button

Click Help at the bottom of the dialog box to get information about the entries on the dialog boxes. Click Help in a warning dialog box to get information about the specific error.

About the ControlNet Adapter

The 1440-ACNR ControlNet Adapter allows XM modules to communicate over the ControlNet network. The 1440-ACNR interfaces to a Logix controller.

When RSLogix 5000 downloads the XM module configuration to a Logix controller, the controller attempts to establish a direct connection to each XM module in the I/O Configuration.

The controller maintains and monitors its connection with the XM module. Any break in the connection, such as a module fault or removal of the module while under power, causes the controller to set fault status bits in the Input Tag associated with the module.

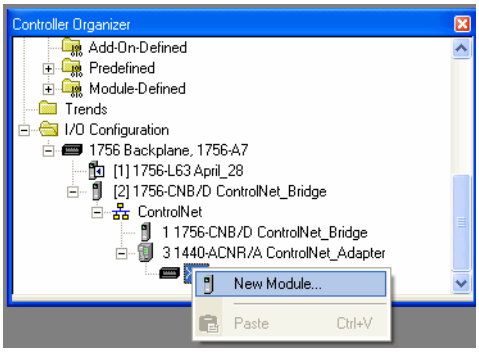
For more information about the 1440-ACNR, refer to the XM ControlNet Adapter User Manual, publication ICM-UM001.

Add the XM Module to the I/O Configuration Tree

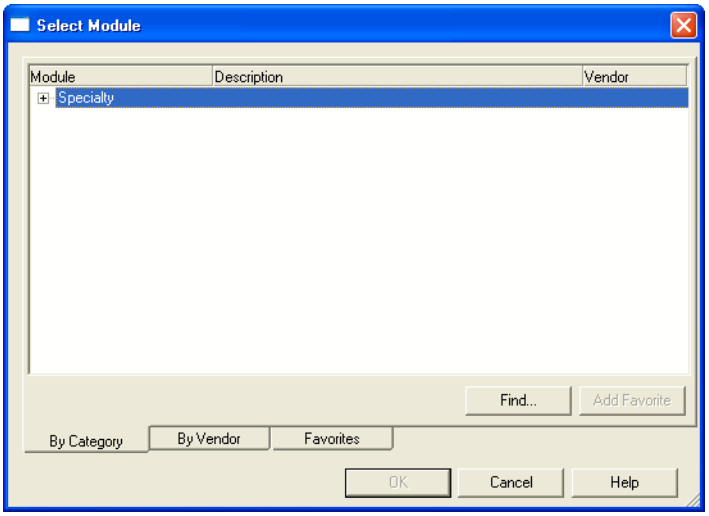
To add the XM module in RSLogix 5000 software, complete the following steps.

1. Configure your adapter. Refer to the XM ControlNet Adapter user manual, publication ICM-UM001, for information on how to configure the adapter.

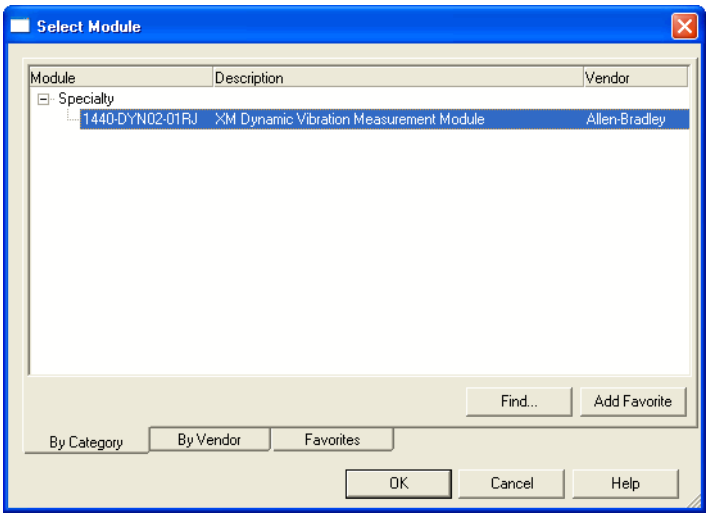
2. Right-click the 1440-ACNR ControlNet Adapter under I/O configuration and select New Module.



The Select Module dialog box opens.



3. Click the plus sign next to the Specialty folder to display a list of XM modules.



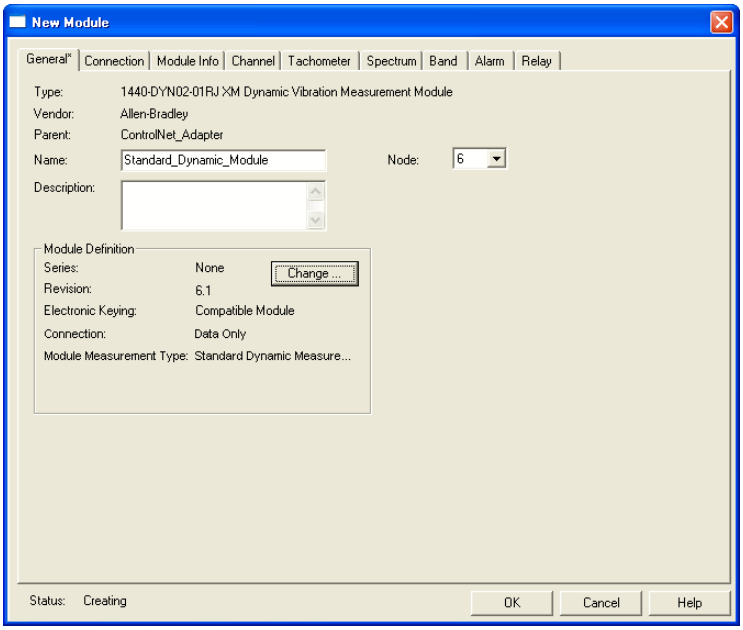
4. Select the 1440-DYN02-01RJ module and click OK.

TIP

If you do not see the module in the list, you may need to obtain the AOP from the Rockwell Automation support website.

1. Go to http://www.rockwellautomation.com/support/.
2. Click Downloads/RSLogix 5000 I/O Modules Add-on Profiles.
3. Select the 1440-DYN02-01RJ XM Dynamic Vibration Measurement Module Add-on Profile.

The New Module dialog box opens.



5. From the Module Properties dialog box, enter this information.

On this tab	In this field	Value/Comment
General	Name	Enter a unique name for the module.
	Node Address	Enter the XM node address of the module. This number and the dip switches on the module must match. See Set the Node Address on page 50.

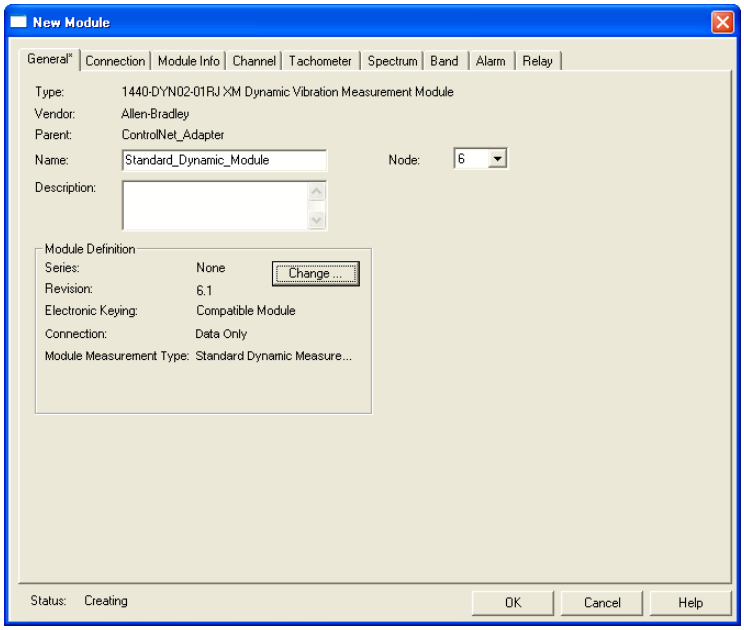
6. Click OK.

The module is added to the project.

Configure Module Properties

Follow these steps to configure the Module Properties for the Dynamic Measurement module.

If the Module Properties dialog box is not already open, double-click the Dynamic Measurement module in the I/O configuration tree.



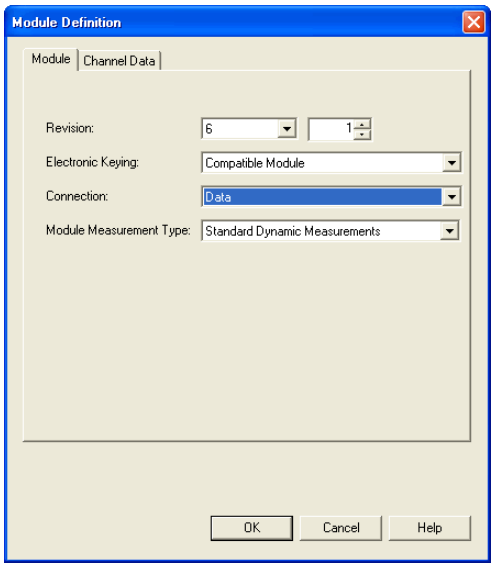
The Module Properties dialog box contains these tabs:

- General
- Connection
- Module Info
- Channel
- Tachometer
- Spectrum
- Band
- Alarm
- Relay (virtual relay)

Configure the Module Definition Properties

The Module Definition dialog box allows you to modify module properties and to select the measurements to be collected by the Dynamic Measurement module. The measurements you select are used to calculate the size of the connection and to generate the input tag data type.

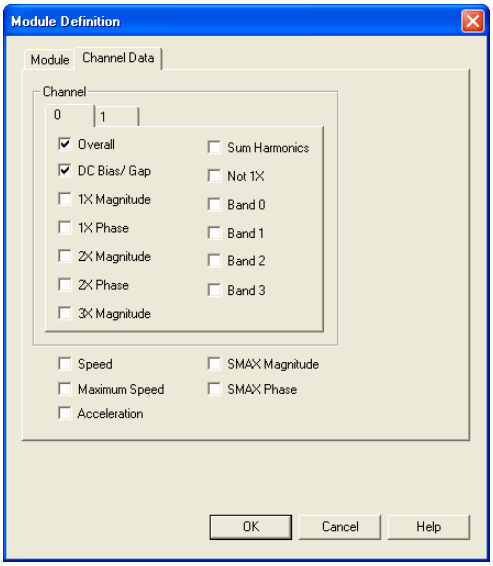
1. From the General tab, click Change.



2. From the Module tab, enter the following information.

On this tab	In this field	Value/Comments
Module	Revision	Choose the appropriate major and/or minor revision of the module.
	Electronic Keying	Choose the appropriate electronic keying method.
	Connection	Data is the only valid choice.
	Module Measurement Type	Standard Dynamic Measurement is the only valid measurement type. This parameter determines the parameters and type of measurements collected by the Dynamic Measurement module. The Standard Dynamic Measurement Type supports measurements of dynamic inputs such as vibration, pressure, and strain. It also provides a tachometer that makes it particularly well-suited for monitoring shaft and casing and pedestal vibration in rotating equipment.

3. Click Channel Data tab to select the measurements for each channel.



4. Click the Channel and then click the measurements that you want to store in the input data tag. This determines which input data tags to generate and the size of the ControlNet connection

IMPORTANT Including more measurements in the Input Tag increases the size of the ControlNet Connection.

On this tab	In this field	Value/Comments
Channel Data	Channel	Sets the corresponding channel's configuration parameters.
	Overall	The measured overall value. Overall measures the amplitude of the vibration signal at all frequencies between the analog high and low pass filter, or if specified, the digital low pass filter.
	DC Bias/Gap	The measured average DC offset of the transducer signal.
	1X Magnitude	The measured magnitude of the vibration at the machine speed.
	1X Phase	The measured phase of the vibration at the machine speed.
	2X Magnitude	The measured magnitude of the vibration at 2 times the machine speed.
	2X Phase	The measured phase of the vibration at 2 times the machine speed.
	3X Magnitude	The measured magnitude of the vibration at 3 times the machine speed.
	Sum Harmonics	The sum of the amplitude of the harmonics in the range from the specified starting order through the frequency maximum.
	Not 1X	The measured magnitude of the vibration excluding the vibration at the machine speed.
	Band 0 - 3	The measured magnitude of the vibration within selected band frequency bands.
	Speed	The measured speed value for the machine.
	Maximum Speed	The maximum speed value for the machine. This is the greatest measured speed value since the most recent reset. You can reset the Maximum Speed using MaxSpeedReset in the output tag. See I/O Data Tags on page 91.
Channel Data	Acceleration	The measured acceleration value for the machine. The acceleration is the rate of change in the speed.
	SMAX Magnitude	The greatest peak magnitude around the orbit.
	SMAX Phase	The phase at which the greatest peak magnitude occurs around the orbit.

5. When finished selecting the measurements, click OK.

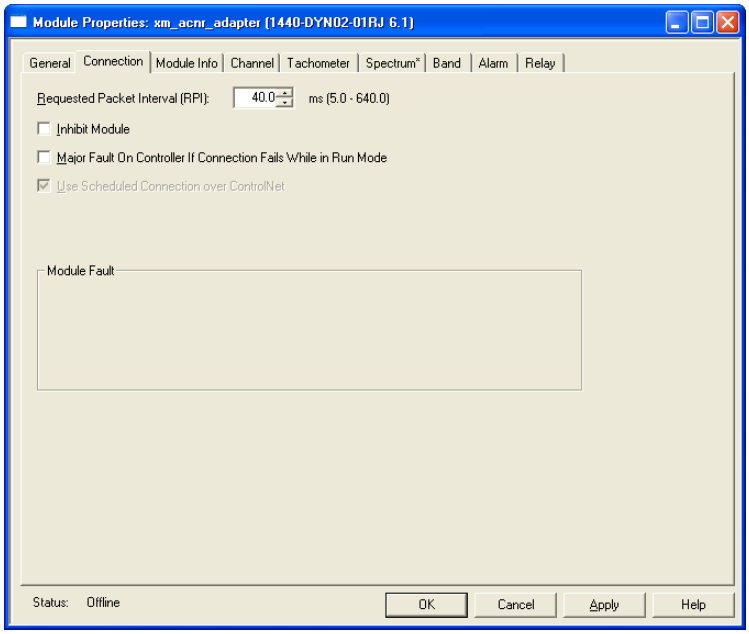
   A confirmation dialog box appears to confirm any changes you are making to the module definition.

6. Click Yes to update the appropriate values and return the General tab. Click No to return to the General tab discarding any changed values.

Configure the Connection Properties

Use the Connection tab to modify the controller-to-module behavior.

1. From the Module Properties dialog box, click the Connection tab.



2. Enter the following information.

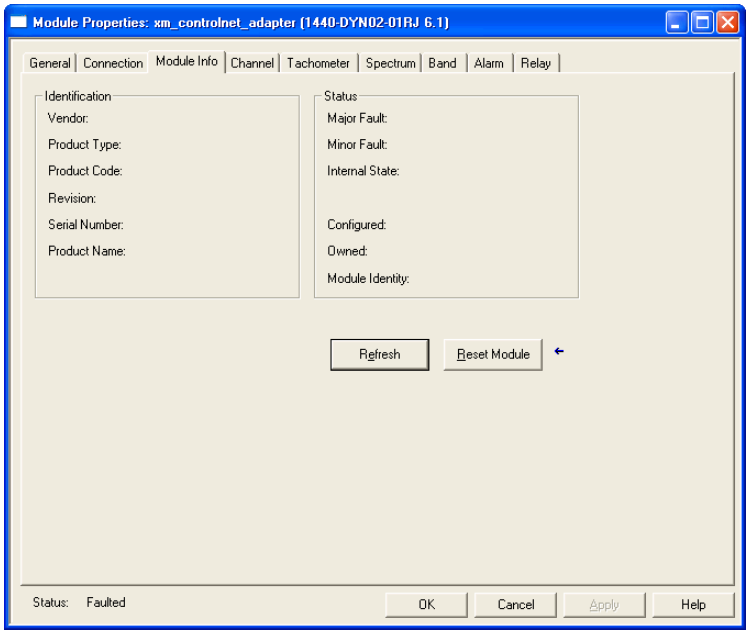
In this field	Values are	Comments
Requested Packet Interval (RPI)	Enter a value between 20...640 ms, in 1 ms increments. The default is 40 ms.	Specifies the period at which data updates over a connection. **Note:** If four updates are missed, the connection closes and CommFault is set in the input tag. (See Input Data Type on page 92).
Inhibit Module	Check to disable communication between the controller and the module. Clear to restore communication between the controller and the module.	
Major Fault on Controller if Connection Fails While in Run Mode	Check to have the controller produce a major fault if the connection fails in Run mode. Clear if the controller should not produce a major fault if the connection fails in Run mode.	
Module Fault		Displays the fault code returned from the controller and the text detailing the Module Fault. Click Help for additional information.

3. When finished, click one of these as needed.
   - OK - Click to accept your edits and close the dialog box.
   - Cancel - Click to close the dialog box without accepting your edits.
   - Apply - Click to accept and apply your edits on any dialog box and continue editing.

Monitor and Reset the Module Status Information

Use the Module Info tab to view module and status information. You can also reset the module to its power-up state from this tab. Note that the data on this tab comes directly from the module when it is online.

1. From the Module Properties dialog box, click the Module Info tab.



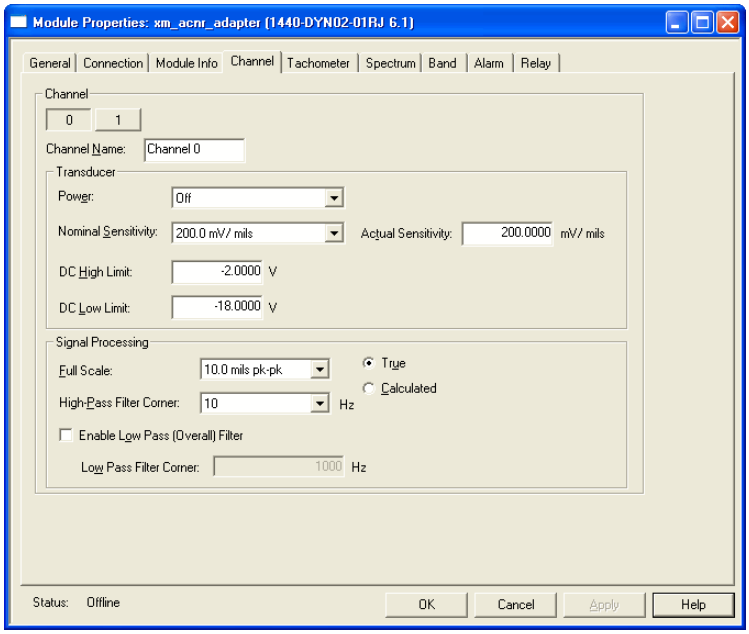
2. Click Refresh to refresh tab with new data from the module.

3. Click Reset Module to return a module to its power-up state by emulating the cycling of power.

Configure the Channel Properties

Use the Channel tab to define the characteristics of the transducer and the signal processing performed on the input signals. The Dynamic Measurement module has two input channels.

1. From the Module Properties dialog box, click the Channel tab.



2. Click the Channel that you want to configure.

3. Configure the parameters as necessary.

In this field	Values are	Comments
Channel Name	Enter a descriptive name for the channel.	The channel name is not sent to the XM module.
Power	Choose the type of power supplied to the transducer. • Off • IEPE (externally supplied) • -24V (externally supplied) • +24V (externally supplied from the terminal base) • Bias Current (externally supplied)	See Connecting the Transducer on page 34 for wiring requirements. See table below.

Approximate Expected Bias Voltage (V DC)

Power	Normal Connected Sensor	Open Circuit	Short Circuit	Unconnected Sensor	DC Low Limit Default	DC High Limit Default
Off	sensor bias voltage (-10...10V DC typical)	2	0	2	-10	10
IEPE	sensor bias voltage (12...20V DC typical)	24	0	24	12	20
+24V	sensor bias voltage (1...20V DC typical)	2	0	2	1	20
-24V	sensor bias voltage (-14...-8V DC typical)	2	0	2	-14	-8
Bias Current	0.47V with 2000 ohm coil	13	0	13	0.2	2

<table>
<tr><th>In this field</th><th>Values are</th><th>Comments</th></tr>
<tr><td>Nominal Sensitivity</td><td>Choose the sensitivity of the transducer.

<table><tr><th>Quantity of Measure</th><th>Nominal Sensitivity</th></tr><tr><td>Acceleration</td><td>10.0 mV/ g
25.0 mV/ g
50.0 mV/ g
100.0 mV/ g
500.0 mV/ g
1000.0 mV/ g
10000.0 mV/ g</td></tr><tr><td>Velocity</td><td>100.0 mV/ in/s
150.0 mV/ in/s
200.0 mV/ in/s
500.0 mV/ in/s
1000.0 mV/ in/s
4.0 mV/ mm/s
6.0 mV/ mm/s
8.0 mV/ mm/s
20.0 mV/ mm/s
40.0 mV/ mm/s</td></tr><tr><td>Displacement</td><td>100.0 mV/ mil
150.0 mV/ mil
200.0 mV/ mil
285.0 mV/ mil
3.94 mV/ µm
5.91 mV/ µm
7.87 mV/ µm
11.2 mV/ µm</td></tr><tr><td>Pressure</td><td>20.0 mV/ psi
50.0 mV/ psi
100.0 mV/ psi
0.29 mV/ mbar
0.73 mV/ mbar
1.45 mV/ mbar</td></tr><tr><td>Volts</td><td>1000.0 mV/V</td></tr></table></td><td>Your choice controls the list of possible full scale selections.

The default is 200.0 mV/mil (displacement).</td></tr>
<tr><td>Actual Sensitivity</td><td>Enter the sensitivity value of the transducer that is included with the transducer's calibration documentation. Due to manufacturing variation, the actual sensitivity may be different than the nominal sensitivity.</td><td>This value is +/- 15% of the Nominal Sensitivity value, see the above table.

Note: The nominal sensitivity is used if you leave this field blank.</td></tr>
<tr><td>DC High Limit</td><td>Enter the maximum expected DC bias voltage from the transducer.</td><td rowspan="2">Enter a value between -24...24 volts. See Approximate Expected Bias Voltage (V DC) Table on page 65.

Note: A voltage reading outside this range constitutes a transducer fault, which is indicated by the Channel LED flashing red and the Ch0Fault or Ch1Fault input tag, depending on the channel.

For information about the LEDs, see page 87. For information about the input tags, see page 91.</td></tr>
<tr><td>DC Low Limit</td><td>Enter the minimum, or most negative, expected DC voltage from the transducer.</td></tr>
</table>

In this field	Values are	Comments
Full Scale	Choose the maximum signal level expected to be processed by the channel. If the full scale value is peak or peak-to-peak, select the measurement performed (true or calculated) to produce the overall value.	The default value and the available values depend on the Nominal Sensitivity selection.
True	The actual or literal measure of the signal. It is the maximum peak in the sample (time waveform) for pk measurements, or the difference between the maximum and minimum peaks for pk-pk measurements.	These parameters are dimmed when full scale is set to an RMS value. **Note:** For a pure sine wave, the true and calculated values are equal. The true and calculated values will diverge as additional signals are added to the waveform, or as non-sinusoidal or non-repetitive signals are included. For protection applications where the objective is to preclude contact between stationary and moving components, True is the appropriate measurement since it is a better indication of actual movement. For conditioning monitoring applications where the objective is to indicate the total energy in the system (that is the overall value), Calculated is the preferable measurement.
Calculated	The RMS value of the sample (time waveform) multiplied by the square root of two (1.414) if measuring the peak value, or two times the square root of two (2.828) if measuring the peak-to-peak value. **IMPORTANT** When full scale is set to an RMS value, including Calculated Pk or Calculated Pk-Pk, the XM module is configured to accept input signals as high as 6X the specified full scale without saturating the electronics. This is because a signal with moderate RMS value may have very high spikes because RMS is an averaging mechanism. If True Pk or True Pk-Pk is selected, the module is configured to spread the full scale range over the entire measurement range, without reserving this 6X headroom used for RMS. This gives better resolution within the full scale range but causes the signals to be clipped at levels just above the full scale.	
High-Pass Filter Corner	Choose the high pass filter to apply to the measurement. • 0.2 Hz • 1 Hz • 5 Hz • 10 Hz • 40 Hz	The high pass filter is useful in removing low frequency signal components that might dominate the signal, particularly when integrating. The high pass filter attenuates all frequencies below the filtered frequency. It allows, or passes, frequencies above the defined frequency.

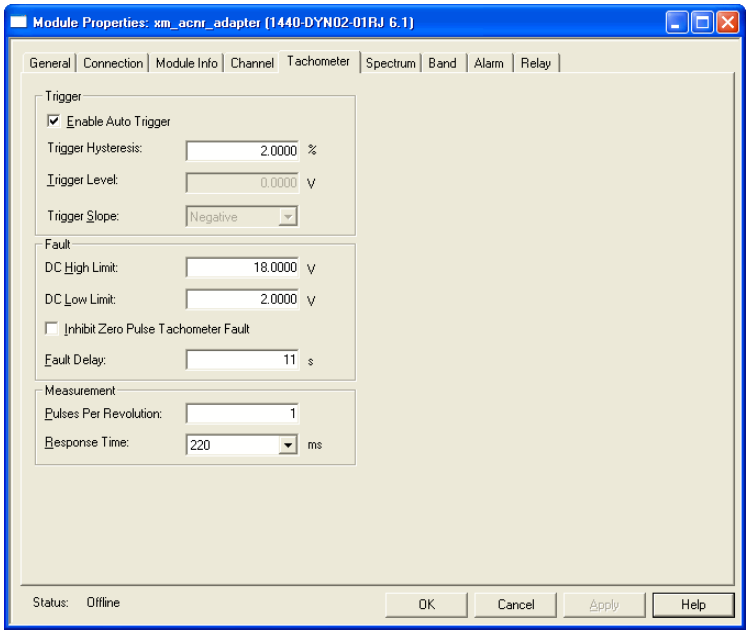
In this field	Values are	Comments
Enable Low Pass (Overall) Filter	Check to apply a low pass filter to the Overall Measurement. Clear to disable the low pass filter.	The filter is applied only to the Overall Measurement. It will not affect the time waveform, spectrum, or measurements made from the spectrum.
Low Pass Filter Corner	Enter the frequency value above which the input signal will be significantly attenuated.	Enter a value between 200...20,000 Hz. **Note:** This parameter is available only when Enable Low Pass Filter is checked.

4. When finished, click one of these as needed.
   - OK - Click to accept your edits and close the dialog box.
   - Cancel - Click to close the dialog box without accepting your edits.
   - Apply - Click to accept and apply your edits on any dialog box and continue editing.

Configure the Tachometer Properties

The Tachometer tab defines the characteristics of the tachometer and the signal processing that will be performed on the tachometer signal.

1. From the Module Properties dialog box, click the Tachometer tab.



2. Configure the parameters, as necessary.

In this field	Values are	Comments
Enable Auto Trigger	Check to enable Auto Trigger mode. The minimum signal amplitude for triggering is 2 volts peak-to-peak and the minimum frequency is 6 CPM (0.1 Hz). Clear to enable Manual Trigger mode. The value entered in Trigger Threshold is used as the trigger point. The minimum signal amplitude for triggering is 500 millivolts peak-to-peak and the minimum frequency is 1 CPM (0.016 Hz).	Using Auto Trigger mode may cause the tachometer to trigger on noise if the signal is very small. For example, you have 1 volt of noise on a 2 volt signal. To prevent this, make sure the % noise in the signal is less than the value entered in the Trigger Hysteresis.
Trigger Hysteresis	Enter the amount of hysteresis around the trigger threshold.	Enter a value between 0...50. In Auto Trigger mode, the value entered is a percentage of the peak-to-peak input signal. In Manual Trigger mode, the value entered is a voltage level. The hysteresis voltage is added to or subtracted from the threshold voltage to determine the hysteresis range.
Trigger Level	Enter the signal level to be used as the trigger value when in Manual Trigger mode.	This parameter is dimmed in Auto Trigger mode.
Trigger Slope	Choose the input signal slope to be used with the trigger value. • Positive • Negative The trigger point of the tachometer defines 0° for phase measurement. If the tachometer is a square wave, the phase angles measured will vary by 180° depending on whether the Trigger Slope is set to positive or negative.	
DC High Limit	Enter the maximum expected DC bias voltage from the transducer.	A voltage reading outside this range constitutes a transducer fault, which is indicated with the tachometer LED blinking red and the TachFault input tag. For information about the LEDs, see page 87. For information about the input tags, see page 91.
DC Low Limit	Enter the minimum, or most negative, expected DC voltage from the transducer.	
Inhibit Zero Pulse Tachometer Fault	Check to enable Inhibit Zero Pulse Tachometer Fault. Clear to disable Inhibit Zero Pulse Tachometer Fault.	Controls whether a tachometer fault occurs if no pulses are detected on the tachometer signal.
Fault Delay	Enter the number of seconds that the module should wait after the last valid pulse signal before it indicates a tachometer fault.	Enter a value between 1...64 seconds.

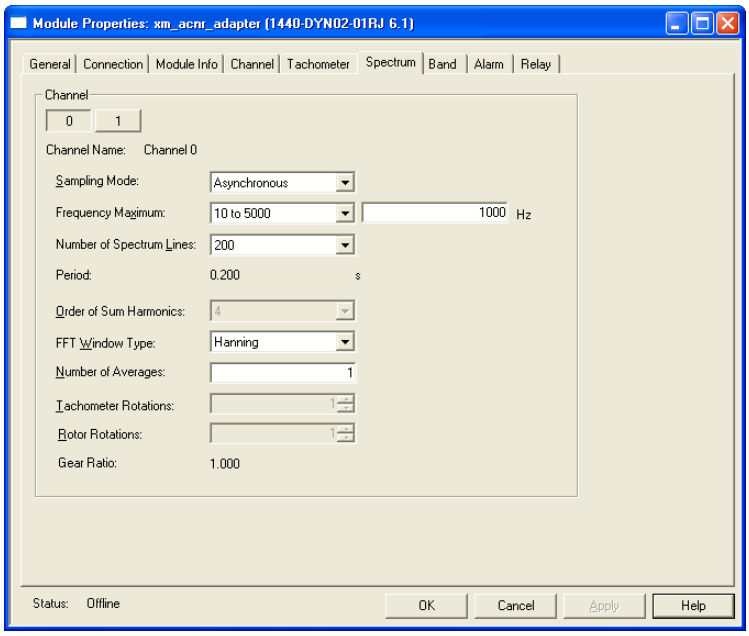
In this field	Values are	Comments
Pulses Per Revolution	Enter the number of tachometer signal pulses per revolution of the shaft. If the speed sensor is a proximity probe over a keyway, there will be one pulse around the shaft. If the speed sensor is a proximity probe over a gear, there will be a pulse for each tooth on the gear. If the sensor detects reflective tape or paint, there will be a pulse for each reflective area around the shaft.	Enter 0 (zero) if you are not using a tachometer. This disables the speed, acceleration, and most phase measurements.
Response Time	Choose how quickly the measured speed value and acceleration value responds to a change in the input signal. • 2640 ms • 220 ms • 22 ms For example, setting this to 220 ms means that the speed is averaged over a quarter second, and the reported value will reach 90% of the new steady state value about 220 ms after the change in machine speed.	Faster response times (22 ms) produce measurements that are more accurate but are more susceptible to noise. Slower response times (220 ms, 2640 ms) produce less accurate measurements but are less susceptible to noise. Fast response times are generally used when you need to track rapid speed changes. Slow response times are generally used for steady speed applications or applications where it is not necessary to track speed during rapid changes.

3. When finished, click one of these as needed.
   - OK - Click to accept your edits and close the dialog box.
   - Cancel - Click to close the dialog box without accepting your edits.
   - Apply - Click to accept and apply your edits on any dialog and continue editing.

Configure the Spectrum Properties

The Spectrum tab configures the spectrum and waveform measurements from the Dynamic Measurement module. There are two instances of the spectrum/waveform measurements, one for each channel.

1. From the Module Properties dialog box, click the Spectrum tab.



2. Click the Channel that you want to configure.

3. Configure the parameters, as necessary.

In this field	Values are	Comments
Channel Name	A descriptive name for the channel.	This can be entered on the Channel tab. See Configure the Channel Properties on page 64.
Sampling Mode	Choose the sampling mode. • Asynchronous • Synchronous with tach	The sampling mode determines whether the signal is synchronized with the tachometer signal and has several effects on the resulting measurements. Synchronous sampling requires a tachometer signal.

<table>
<tr><th>In this field</th><th>Values are</th><th>Comments</th></tr>
<tr><td>Sampling Mode continued.</td><td>
<table>
<tr><th>Asynchronous Sampling</th><th>Synchronous Sampling</th></tr>
<tr><td>The waveform measurement is time-based</td><td>The waveform measurement is position-based.</td></tr>
<tr><td>The spectrum measurement is frequency-based.</td><td>The spectrum measurement is order-based and the Number of Lines must be evenly divisible by Frequency Maximum.</td></tr>
<tr><td>The Frequency Maximum must be specified in Hz.</td><td>Frequency Maximum must be specified in orders.</td></tr>
</table>
</td><td></td></tr>
<tr><td>Frequency Maximum</td><td>The maximum frequency or order for the spectrum measurement.</td><td>The sampling mode determines whether the frequency maximum is specified in Hz or orders. It also determines whether you enter a value or choose a value from a list of available values.
• If Sampling Mode is Synchronous with tach, enter the Frequency Maximum value. The frequency maximum range for synchronous sampling mode is 4...200 orders.
• If Sampling Mode is Asynchronous, choose the Frequency Maximum value. Note you may enter a specific value if you choose 10 to 5000 range. Supported maximum asynchronous frequencies are dependent on sensitivity units and full scale units you choose on the Channel tab. See tables below.</td></tr>
</table>

		Full Scale Units (Channel tab)				
		mil µm	in/s mm/s	g	V	Psi mbar
Sensitivity Units (Channel tab)	mil µm	Column A				
	in/s mm/s	Column A	Column A			
	g	Column B	Column B	Column A		
	V				Column A	
	Psi mbar					Column A

Frequency	A	B
10 to 5000	X	X
6250	X	X
7500	X	X
8000	X	
9375	X	X
10000	X	
12500	X	
15000	X	
18750	X	X
20000	X	

In this field	Values are	Comments
Number of Spectrum Lines	Choose the number of lines (bins) in the spectrum measurement. • 100 • 200 • 400 • 800	This determines the frequency resolution of the spectrum measurement. **Note:** When Sampling Mode is synchronous, the Number of Spectrum Lines must be evenly divisible by the Frequency Maximum value (no remainder).
Period	Displays the total period of the waveform measurement in seconds. Samples are accumulated into a time waveform of this duration before an FFT is performed on the collected data. Period is provided to show the effect various settings, such as Number of Spectrum Lines, have on the update rate of measurements (Band and Vector) derived from the spectrum.	The value is in seconds when Sampling Mode is set to asynchronous. The value is in cycles when Sampling Mode is set to synchronous.
Order of Sum Harmonics	Choose the starting order for the sum harmonics measurement. • 1 • 2 • 3 • 4 • 5	The amplitudes of all harmonics from the specified harmonic through the Frequency Maximum are included in the sum. **Note:** The sum harmonics measurement requires the tachometer to be enabled (Pulses Per Revolution is set to 1 or more), and a tachometer signal must be present.

In this field	Values are	Comments
FFT Window Type	Choose the type of window to be applied to the waveform measurement prior to computing the spectrum. • Rectangular - Also know as Uniform (no window). Use this only for transient signals that die out before the end of the time sample, or for exactly periodic signals within the time sample. Gives poor peak amplitude accuracy, good peak frequency accuracy. • Hamming - A general purpose window that is similar to a Hanning window. It provides better frequency resolution but decreased amplitude accuracy when compared to the Hanning window. Use it to separate close frequency components. Gives fair peak amplitude accuracy, fair peak frequency accuracy. • Hanning - A general purpose window that is similar to a Hamming window. It is used on random type data when frequency resolution is more important than amplitude accuracy. Most often used in predictive maintenance. Gives fair peak amplitude accuracy, fair peak frequency accuracy. • Flat Top - Also called Sinusoidal window. Use this when amplitude accuracy is more important than frequency resolution. In data with closely spaced peaks, a Flat Top window may smear the peaks together into one wide peak. Gives good peak amplitude accuracy, poor peak frequency accuracy for data with discrete frequency components. • Kaiser Bessel - Gives fair peak amplitude accuracy, fair peak frequency accuracy.	
Number of Averages	Enter the number of individual data sets to be incorporated into the average calculation. Averaging reduces the random errors and provides a more reliable measurement.	In asynchronous mode, the spectrum is averaged. In synchronous mode, the time waveforms are averaged. **Note:** The averaged data is used only for captured time waveform or FFT's. All data calculated from the FFT, such as bands, is taken from each individual sample, not the averaged sample.

In this field	Values are	Comments
Tachometer Rotations	Enter the number of teeth on the buried shaft gear.	Set the value between 1...65,535. These parameters are dimmed in asynchronous sampling.
Rotor Rotations	Enter the number of teeth on the external shaft gear.	
Gear Ratio	Displays the relationship between the Tachometer Rotations and the Rotor Rotations parameters. The Tachometer Rotations and Rotor Rotations are used to convert the speed measured by the speed sensor to a shaft speed that is related by this gear ratio. This is useful when the shaft of interest does not have a speed sensor of its own. When a gear ratio is configured, the synchronous measurements are synchronized with the rotation of the buried (internal) shaft. This includes the Vector, Not 1X, Sum Harmonics, and order-based Band measurements. Synchronous averaging is also synchronized with the internal shaft. However, the Speed measurement is not affected by the gear ratio. The Speed measurement always reflects the speed of the shaft with the speed sensor (raw tachometer speed divided by number of pulses per revolution).	This parameter applies only to synchronous sampling.

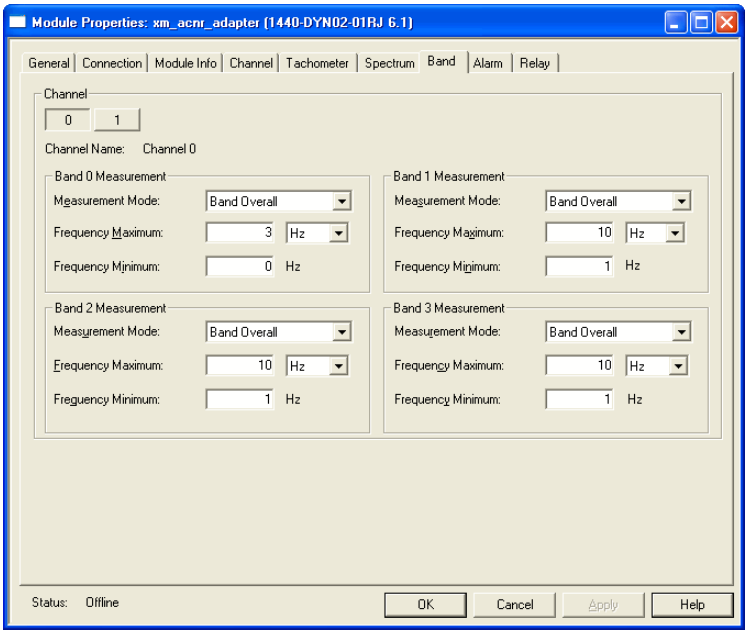
4. When finished, click one of these as needed.
   - OK - Click to accept your edits and close the dialog box.
   - Cancel - Click to close the dialog box without accepting your edits.
   - Apply - Click to accept and apply your edits on any dialog and continue editing.

Configure the Band Properties

The Band tab configures the bandwidth for each band measurement from the Dynamic Measurement module. There are four sets of band measurement for each channel.

TIP The frequency ranges for each band may overlap. For example, Band 1 Minimum Frequency is 500 Hz and Maximum Frequency is 1500 Hz, and Band 2 Minimum Frequency is 1000 Hz and Maximum Frequency is 3000 Hz.

1. From the Module Properties dialog box, click the Band tab.



2. Click the Channel that you want to configure.

3. Configure the parameters, as necessary.

In this field	Values are	Comments
Channel Name	A descriptive name for the channel.	This can be entered on the Channel tab. See Configure the Channel Properties on page 64.
Measurement Mode	Choose the measurement (or calculation) performed to produce the Band Value. • Band Overall - The band value is the square root of the sum of the squares (RSS) of the amplitude values for the bins that make up the band. • Maximum Peak - The band value is equal to the maximum bin amplitude found within the band.	
Frequency Maximum	Enter the upper limit of the range of spectrum bins to be included in the band measurement, and the frequency units (Hz or Orders). Set the value using the table below.	This value must be greater than the Band Frequency Minimum.
Frequency Minimum	Enter the spectrum bin with the least frequency to be included in the band measurement.	

Sampling Mode	Spectrum Frequency Max Units	Band Units	Band Frequency Max
Synchronous	Orders	Hz	0...5000
		Orders	0.01...200
Asynchronous	Hz	Hz	0...20,000
		Orders	0.01...200

IMPORTANT

For bands specified in Hz on an orders-based spectrum (Sampling Mode set to Synchronous with tach), the band measurement value will be zero when the Band Frequency Minimum and Frequency Maximum fall completely beyond the frequencies represented in the spectrum. If any of the band falls within the spectrum, only that portion will contribute to the band value.

Example

Band Frequency Maximum = 250 Hz

Band Frequency Minimum = 150 Hz

Spectrum Frequency Maximum = 10 Orders

The following table shows the actual Band Frequency Maximum and Minimum values given different operating speeds for this example. Note that when the speed is 600 RPM, the Band Frequency Maximum and Minimum values fall outside the range of the Spectrum Frequency Maximum, so that the band value will be zero. When the speed is 1200 RPM, the band will be calculated from 150…200 Hz.

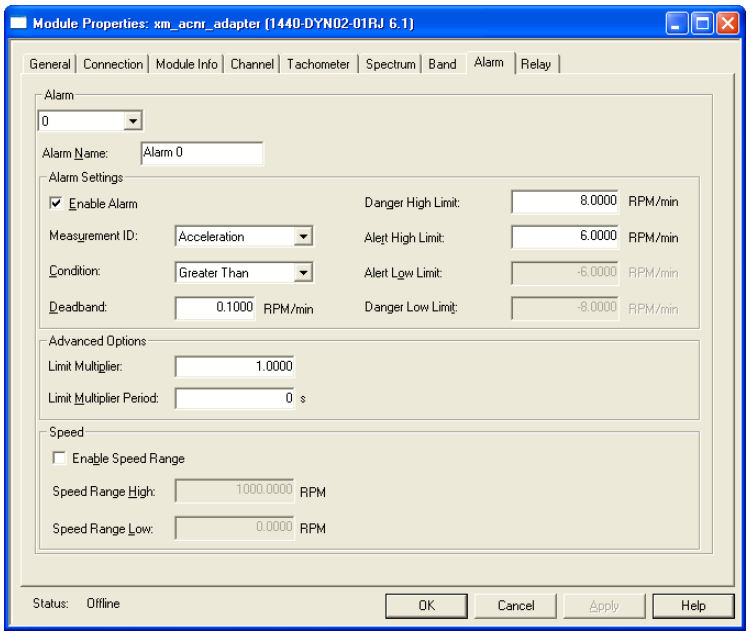
Speed (RPM)	Max Frequency Represented in Spectrum (Hz)	Band Min (Hz)	Band Max (Hz)
2400	400	150	250
1800	300	150	250
1200	200	150	200
600	100	n/a	n/a

4. When finished, click one of these as needed.
   - OK - Click to accept your edits and close the dialog box.
   - Cancel - Click to close the dialog box without accepting your edits.
   - Apply - Click to accept and apply your edits on any dialog and continue editing.

Configure the Alarm Properties

Use the Alarm tab to configure the alarms for the Dynamic Measurement module. Each alarm supports two alarm levels (Alert level and Danger level). The AOP supports six alarms.

1. From the Module Properties dialog box, click the Alarm tab.



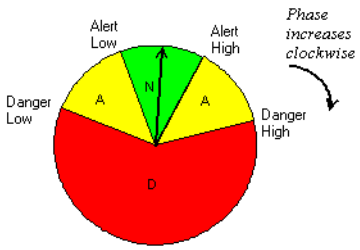
2. Choose an alarm from the Alarm list. The Add-on Profile supports six alarms.

3. Configure the parameters, as necessary.

In this field	Values are	Comments
Alarm Name	Enter a descriptive name for the alarm.	The alarm name is not sent to the XM module.
Enable Alarm	Check to enable the alarm. Clear to disable the alarm.	

In this field	Values are	Comments
Measurement ID	Choose the measurement and channel that is associated with the alarm. • Ch 0 / Ch 1 Overall • Ch 0 / Ch 1 DC Bias/Gap • Ch 0 / Ch 1 Band 0 • Ch 0 / Ch 1 Band 1 • Ch 0 / Ch 1 Band 2 • Ch 0 / Ch 1 Band 3 • Speed • SMAX Magnitude • Ch 0 / Ch 1 1X Magnitude • Ch 0 / Ch 1 2X Magnitude • Ch 0 / Ch 1 3X Magnitude • Ch 0 / Ch 1 Not 1X • Ch 0 / Ch 1 Sum Harmonics • Ch 0 / Ch 1 1X Phase • Ch 0 / Ch 1 2X Phase • SMAX Phase • Acceleration	Multiple alarms can be set on the same measurement.
Condition	Choose when the alarm should trigger. • Greater Than - Trigger the alarm when the measurement value is greater than or equal to the Alert and Danger Limit values. The Danger High Limit value must be greater than or equal to the Alert High Limit value for the trigger to occur. • Less Than - Trigger the alarm when the measurement value is less than or equal to the Alert and Danger Limit values. The Danger High Limit value must be less than or equal to the Alert High Limit value for the trigger to occur. • Inside Range - Trigger the alarm when the measurement value is equal to or inside the range of the Alert and Danger Limit values. The Danger High Limit value must be less than or equal to the Alert High Limit value AND the Danger Low Limit value must be greater than or equal to the Alert Low Limit value for the trigger to occur. • Outside Range - Trigger the alarm when the measurement value is equal to or outside the range of the Alert and Danger Limit values. The Danger High Limit value must be greater than or equal to the Alert High Limit value AND the Danger Low Limit value must be less than or equal to the Alert Low Limit value for the trigger to occur.	

In this field	Values are	Comments
Deadband	Enter the amount that the measured value must fall (below the limit) before the alarm condition is cleared. For example, Alert High Limit is 120 and the deadband is 2. The alarm (alert) activates when the measured value is 120 and will not clear until the measured value is 118 or less.	Set the value between 0...9999. **Note:** For the Outside Range condition, the deadband value must be less than the Alert High Limit - Alert Low Limit.

Danger High Limit	Enter the High Limit value for the danger (shutdown) condition. This parameter is the greater value when Condition is set to Inside Range or Outside Range, or the measurement is a phase measurement.	Phase measurement requirements:
		• The Alert Low, Danger Low, Alert High, and Danger High must define contiguous sections within the set of possible phase values (0...360 degrees).
		• If you were to plot the thresholds on a clock face (illustration below) with phase increasing in the clockwise direction, then:
		  • Alert Low must be clockwise from or equal to Danger Low.
		  • Alert High must be clockwise from Alert Low.
		  • Danger High must be clockwise from or equal to Alert High.
		 

Alert High Limit	Enter the High Limit value for the alert (alarm) condition. This parameter is the greater value when Condition is set to Inside Range or Outside Range, or the measurement is a phase measurement.	
Alert Low Limit	Enter the lesser limit value for the alert (alarm) condition. This parameter is not used when Condition is set to Greater Than or Less Than.	
Danger Low Limit	Enter the lesser limit value for the danger (shutdown) condition. This parameter is not used when Condition is set to Greater Than or Less Than.	
Limit Multiplier	Enter a value to be applied when the AlarmLimitMultiply bit in Output tag is set to 1. The module applies the multiplier to the alarm limits during this time to avoid false alarms at resonance frequencies.	Set the value between 0...10. **Note:** Enter 0 (zero) to disable the alarm during the startup period.
Limit Multiplier Period	Enter the length of time that the Limit Multiplier is applied to the threshold.	Set the value between 0...65535.
Enable Speed Range	Check to enable the speed range alarm. Clear to disable the speed range alarm.	Controls whether the selected alarm is enabled only when the measured speed is within a machine speed range. **Note:** You cannot enable the Speed Range alarm when the Measurement ID is set to Speed.
Speed Range High	Enter the greater threshold of the machine speed range.	These parameters are dimmed when Enable Speed Range is disabled.
Speed Range Low	Enter the lesser threshold of the machine speed range.	

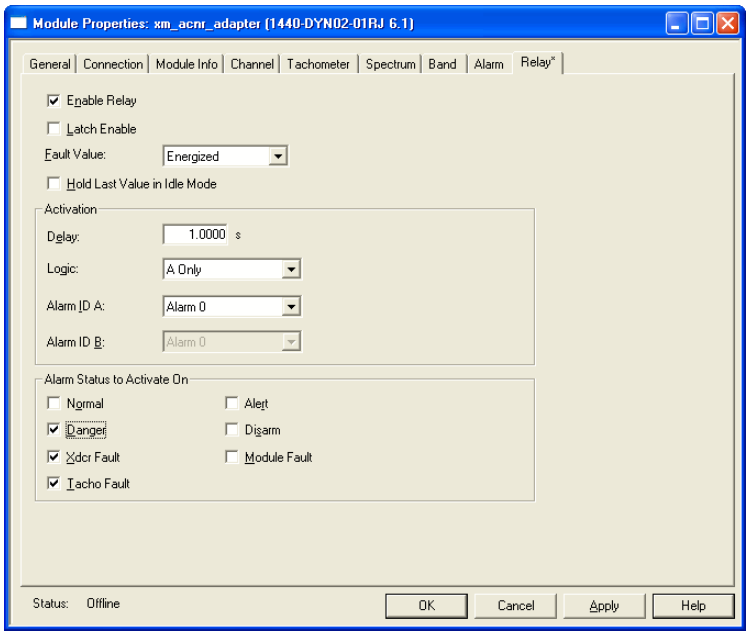
4. When finished, click one of these as needed.
   - OK - Click to accept your edits and close the dialog box.
   - Cancel - Click to close the dialog box without accepting your edits.
   - Apply - Click to accept and apply your edits on any dialog and continue editing.

Configure the Relay Properties

Use the Relay tab to configure the virtual relay for the Dynamic Measurement module. The Relay parameters control the operation of the virtual relay. Use these parameters to configure the alarm(s) associated with the relay and the behavior of the relay.

TIP Hereafter, any reference to the relay implies a virtual relay.

1. From the Module Properties dialog box, click the Relay tab.



2. Configure the parameters, as necessary.

In this field	Values are	Comments
Enable Relay	Check to enable the virtual relay. Clear to disable the virtual relay.	
Latch Enable	Check if the relay must be explicitly reset after the alarm subsides. Clear if you want the relay to reset itself once the alarm condition has passed.	A latched relay can be reset using RelayReset in the output tag. See I/O Data Tags on page 91.
Fault Value	Choose the fault value. • Energized - The relay is de-energized under normal operating conditions and becomes energized when the alarm limits are exceeded. This means that under non-alarm conditions, the relay closes the circuit between the common and the normally closed (N.C.) terminals. Under alarm conditions, the relay changes state to close the circuit between the common and the normally open (N.O.) terminals. • De-energized - The relay is energized under normal conditions, and becomes de-energized when the alarm limits are exceeded. The normally energized operating mode may also be referred to as fail-safe. This means that under non-alarm (with power applied to the unit) conditions, the relay closes the circuit between the common and the N.O. terminals. Under alarm or loss of power conditions, the relay changes state to close the circuit between the common and N.C. terminals.	This determines what happens to the relay when an alarm is indicated. **Note**: This affects only the virtual relay. The Relay tag in the input data type works the same regardless of this configuration setting. One (1) means the associated Condition is present, and 0 means the associated Condition is not present.
Hold Last Value in Idle Mode	Check to retain the last relay state during configuration. For example, if the relay is energized under normal conditions, the relay remains energized on subsequent idle/program mode transitions. If clear, the relay goes to normal state during reconfiguration.	
Delay	Enter the length of time for which the Activation Logic must be true before the relay is activated.	Set the value between 0...65.535 seconds. This reduces the nuisance alarms caused by external noise and/or transient vibration events.

In this field	Values are	Comments
Logic	Choose the relay activation logic. The relay can monitor up to two alarms. • A Only - Relay is activated when Alarm A meets or exceeds the selected Alarm Status to Activate On condition(s). • A OR B - Relay is activated when either Alarm A or Alarm B meets or exceeds the selected Alarm Status to Activate On condition(s). • A AND B - Relay is activated when Alarm A and Alarm B meet or exceeds the selected Alarm Status to Activate On condition(s).	
Alarm ID A	Choose the first alarm that the relay will monitor. The alarm must be from the same device as the relay.	Only enabled alarms appear in the Alarm ID A list.
Alarm ID B	Choose the second alarm that the relay will monitor. The alarm must be from the same device as the relay.	Only enabled alarms appear in the Alarm ID B list. **Note:** This parameter is dimmed when Logic is set to A only.
Alarm Status to Activate On	Choose the alarm conditions that will cause the relay to activate. You can select more than one. • Normal - Activate the relay when the current measurement is not in excess of any alarm limits. • Danger - Activate the relay when the current measurement is in excess of the danger level limit(s). • Xdcr Fault - Activate the relay when a transducer fault is detected on the associated transducer. • Tacho Fault - Activate the relay when the required tachometer signal has not been detected and there is no transducer fault. • Alert - Activate the relay when the current measurement is in excess of the alert level limit(s) but not in excess of the danger level limit(s). • Disarm - Activate the relay when the alarm is disabled. If Setpoint Multiplication is on and the setpoint multiplier is set to zero, the alarm will be disabled and in the Disarm state. • Module Fault - Activate the relay when a failure or error is detected in the hardware or firmware, and is preventing proper operation of the device.	

3. When finished, click one of these as needed.
   - OK - Click to accept your edits and close the dialog box.
   - Cancel - Click to close the dialog box without accepting your edits.
   - Apply - Click to accept and apply your edits on any dialog and continue editing.

Save Module Configuration and Download to the Controller

We recommend that after a module is configured you save your work and download the configuration to the controller and module. Refer to the XM ControlNet Adapter User Manual, publication ICM-UM001, or the ControlNet Modules in Logix5000 Systems User Manual, publication CNET-UM001 for details.

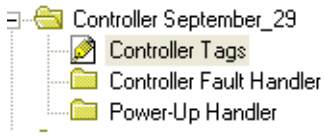
Schedule the I/O Module Connections

You must use RSNetWorx™ for ControlNet software to schedule the network in order to activate the configured XM module. Refer to the XM ControlNet Adapter User Manual, publication ICM-UM001, or the ControlNet Modules in Logix5000 Systems User Manual, publication CNET-UM001 for details.

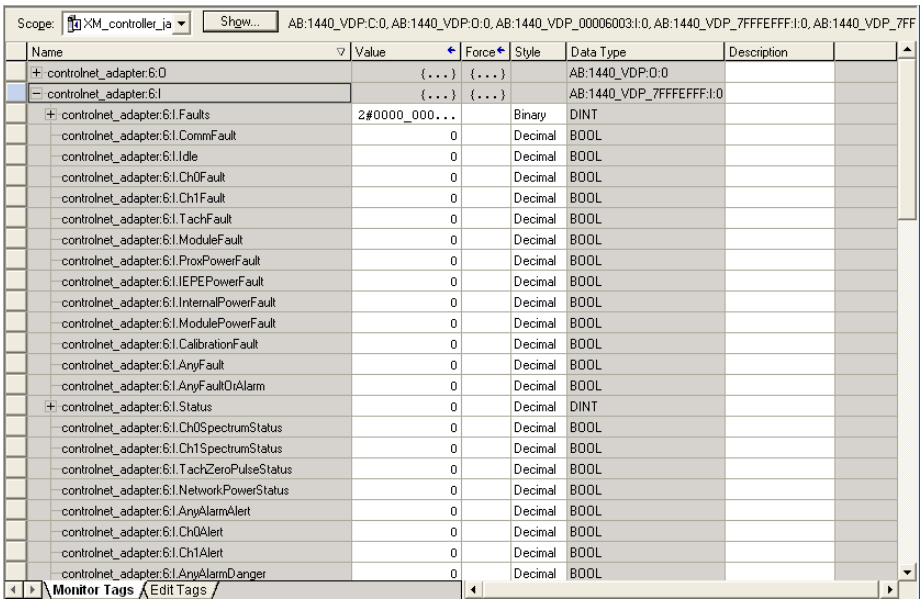
Access Module Data using the ACNR

The module-defined data types and tags are automatically created when you configured the Dynamic Measurement module in RSLogix 5000 software. These tags allow you to access the input, output, and configuration data of the module via the controller's ladder logic.

To access the module data, double-click Controller Tags.



The Controller Tags dialog opens. See I/O Data Tags on page 91 for more information.



- For RSLogix 5000 programming instructions, refer to RSLogix 5000 Configuration and Programming for the Logix5000 Family of Controllers, publication RLD300GR.
- For ControlLogix® controller information, refer to ControlLogix System User Manual, publication 1756-UM001.
- For ControlNet communication information, refer to ControlNet Modules in Logix5000 Systems, publication CNET-UM001.

Notes:

Troubleshoot the Module

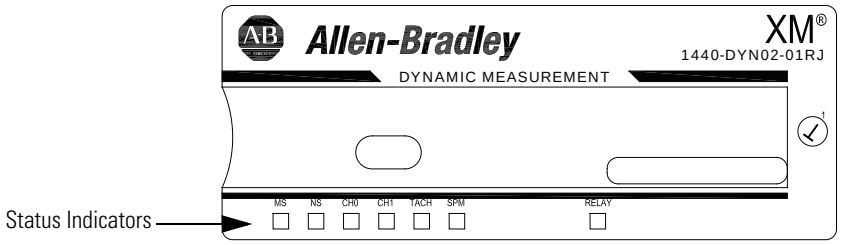
This chapter provides information for diagnosing and troubleshooting your module.

Topic	Page
Status Indicators	87
Module Status (MS) Indicator	88
Network Status (NS) Indicator	88
Channel 0 and Channel 1 Status Indicators	88
Setpoint Multiplier Indicator	89
Relay Indicator	89

Status Indicators

The module has seven LED indicators, which are located on top of the module.

LED Indicators



The status indicators include the following.

- Module Status (MS)
- Network Status (NS)
- Channel 0
- Channel 1
- Tachometer
- Setpoint Multiplier (SPM)
- Relay

Module Status (MS) Indicator

The following table describes the module status indicator.

State	Probable Cause
Off	No power applied to the module.
Alternating Red/Green	Module performing power-up self-test.
Flashing Red	• Application firmware is invalid or not loaded. Download firmware to the module. • Firmware download is currently in progress.
Solid Red	An unrecoverable fault has occurred. The module may need to be repaired or replaced.
Flashing Green	Module operating in Program Mode, not performing its monitoring functions.
Solid Green	Module operating in Run Mode, performing its monitoring functions.

Network Status (NS) Indicator

The following table describes the network status indicator.

State	Probable Cause
Off	Module is not online. • Module is autobauding. • No power applied to the module; look at Module Status LED.
Flashing Red	One or more I/O connections are in the timed-out state.
Solid Red	Failed communications (duplicate MAC ID or bus-off).
Flashing Green	Module is online but no connections are currently established.
Solid Green	Module is online with connections currently established.

Channel 0 and Channel 1 Status Indicators

The following table describes the channel indicators.

State	Probable Cause
Off	• Normal operation within alarm limits on the channel. • No power applied to the module. Look at Module Status LED.
Solid Yellow	An alarm associated with this channel is in Alert.
Solid Red	An alarm associated with this channel is in Danger.
Flashing Red	A transducer fault exists on the channel. The DC bias is outside the DC Low and High Limits.

Tachometer Status Indicators

The following table describes the tachometer indicator.

State	Probable Cause
Off	• Normal operation within alarm limits on the channel. • No power applied to the module. Look at Module Status LED.
Solid Yellow	An alarm on Speed or Acceleration is in Alert.
Solid Red	An alarm on Speed or Acceleration is in Danger.
Flashing Yellow	A tachometer fault other than a transducer fault (for example, no pulse received).
Flashing Red	The tachometer signal DC bias is not within the DC Low and High Limits.

Setpoint Multiplier Indicator

The following table describes the setpoint multiplier indicator

State	Probable Cause
Off	The Alarm Limit Multiplier is not in effect.
Solid Yellow	The Alarm Limit Multiplier is in effect.

Relay Indicator

The following table describes the relay indicator.

State	Probable Cause
Off	The virtual relay is not activated.
Solid Red	The virtual relay is activated.

Using RSLogix 5000 Software to Troubleshoot Your Module

In addition to the status indicators on the module, RSLogix 5000 software alerts you to fault conditions. You are alerted in one of these ways.

- Warning signal in the I/O Configuration next to the module when the connection to the module is broken
- Fault message in a status line
- Notification in the Tag Monitor
  - General module
  - Diagnostic faults
- Status on the Connection and Module Info tabs

Notes:

I/O Data Tags

This appendix describes the module-defined data types for the 1440-DYN02-01RJ standard vibration measurement type. The module-defined data types are automatically created when you configure the XM module using the RSLogix 5000 software Add-on Profile.

Topic	Page
Tag Names and Definitions	91
Module-defined Data Types	92

Tag Names and Definitions

The set of tags associated with any module depends on the module type and the selections you make in the Module Definition dialog box in the AOP. For each module you create, specific instances of these data types are created. These sets of tags apply:

- Input - diagnostic, alarms, and measurements to be sent from the XM module to the Logix controller
- Output - data sent from the Logix controller to the XM module to multiply Alarm Limits, unlatch the virtual relay, and reset the maximum speed measurement
- Configuration - data created with the XM module AOP to configure your transducers, filtering, measurements, and set alarm limits

The table below shows the tag and main module type for the 1440-DYN02-01RJ standard dynamic measurement type.

1440-DYN02-01RJ Tags

Tag	Main Module Defined Type	Subtype Used by Main Type
Input	AB:1440_VDP_7FFFFFFF:I:0[1]	None
Output	AB:1440_VDP:O:0	None
Configuration	AB:1440_VDP:C:0	AB:1440_VDP_ChConfig_Struct.C:0 AB:1440_VDP_AlarmConfig_Struct:C:0

(1) The input data tag is dynamically created by the measurements you select in the Channel Data tab in the Module Definition dialog box. The input data type name varies slightly depending on which measurements you select.

Module-defined Data Types

The following tables list and describe module-defined data types for the 1440-DYN02-01RJ standard dynamic measurement type. The data types define the structure of the data used by the module to store input, output, and configuration data. These tags allow you to access this data via the controller's ladder logic.

These tables include information for input (as indicated by an I), configuration (as indicated by a C), and output (as indicated by an O).

Input Data Type

The members of the input data type are dynamically generated by the measurements you select in the Module Definition dialog box in the RSLogix 5000 software AOP. The size of the connection is calculated by this profile. See Configure the Module Definition Properties on page 60.

The table below shows the complete input data type when all measurements are selected.

Module-defined Data Type: AB:1440_VDP_7FFFFFFF:I:0[(1)]

Member Name	Type	Location	Description
Faults	DINT		Contains the following Fault indicators.
CommFault	BOOL	Faults:0	0 = No communication fault 1 = Communication fault
Idle	BOOL	Faults:17	0 = Module in Run mode 1 = Module in Idle mode Note: Measurements and alarms are not evaluated during Idle mode.
Ch0Fault	BOOL	Faults:18	0 = No fault on Channel 0 1 = Fault on Channel 0 from bias voltage reading outside the DC bias limits
Ch1Fault	BOOL	Faults:19	0 = No fault on Channel 1 1 = Fault on Channel 1 from bias voltage reading outside the DC bias limits
TachFault	BOOL	Faults:20	0 = No fault on tachometer 1 = Fault on tachometer; tachometer is enabled and receiving no pulses within fault timeout period & the Tach DC bias is outside the Tach DC Low and High Limits
ModuleFault	BOOL	Faults:21	0 = No fault on module 1 = Fault on module; either calibration, watchdog, or bad 5V, 24V, IEPE or proximity probe power
ProxPowerFault	BOOL	Faults:22	0 = No fault on proximity probe power 1 = Fault on proximity probe power
IEPEPowerFault	BOOL	Faults:23	0 = No fault on IEPE power 1 = Fault on IEPE power
InternalPowerFault	BOOL	Faults:24	0 = No fault on module 5V supply 1 = Fault on module 5V supply

Module-defined Data Type: AB:1440_VDP_7FFFFFFF:I:0[(1)]

Member Name	Type	Location	Description
ModulePowerFault	BOOL	Faults:25	0 = No fault on 24V supply 1 = Fault on 24V supply; check the supply voltage to the module
CalibrationFault	BOOL	Faults:28	0 = No ROM fault 1 = ROM fault
AnyFault	BOOL	Faults:29	0 = No fault exists on the module 1 = At least one fault exists on the module
AnyFaultOrAlarm	BOOL	Faults:30	0 = No alarms or faults exist on the module 1 = At least one alarm or fault exists on the module
Status	DINT		Contains the following Status indicators
Ch0SpectrumStatus	BOOL	Status:8	0 = Band or vector data has been calculated 1 = Data has not been collected due to warm up period or speed limit condition
Ch1SpectrumStatus	BOOL	Status:9	0 = Band or vector data has been calculated 1 = Data has not been collected due to warm up period or speed limit condition
TachZeroPulseStatus	BOOL	Status:10	0 = No zero pulse tachometer fault 1 = Zero Pulse fault; tachometer is enabled and it is not receiving pulses
NetworkPowerStatus	BOOL	Status:11	0 = Power is applied at the external network terminal 1 = No power is detected at the external network terminal
AnyAlarmAlert	BOOL	Status:12	0 = No alarms are in Alert 1 = At least one alarm is in Alert
Ch0Alert	BOOL	Status:13	0 = No alarms on Channel 0 1 = Channel 0 has an alarm with a measurement in Alert
Ch1Alert	BOOL	Status:14	0 = No alarms on Channel 1 1 = Channel 1 has an alarm with a measurement in Alert
AnyAlarmDanger	BOOL	Status:15	0 = No alarms are in Danger 1 = At least one alarm is in Danger
Ch0Danger	BOOL	Status:16	0 = No alarms on Channel 0 1 = Channel 0 has an alarm with a measurement in Danger
Ch1Danger	BOOL	Status:17	0 = No alarms on Channel 1 1 = Channel 1 has an alarm with a measurement in Danger
RelaysHeld	BOOL	Status:18	Relay is being held at last state while in Idle mode
AlarmLimitMultiply	BOOL	Status:20	0 = Startup switch is not activated; alarm multiplier is not applied to the alarm limits 1 = Startup switch is activated; alarm limit multiplier is applied to alarm limits to avoid false alarms
StartupTime	BOOL	Status:21	0 = Currently not in startup time (alarm multiplier is not active) 1 = Currently in startup time (alarm multiplier is active) which means the startup switch is activated or it is the start up period following the release of the startup switch
Relay	BOOL	Status:23	0 = Relay 0 not tripped (conditions are not met) 1 = Relay 0 tripped
Alarms	DINT		Contains the following Alarm indicators

Module-defined Data Type: AB:1440_VDP_7FFFFFFF:I:0[1]

Member Name	Type	Location	Description
Alarm0Alert	BOOL	Alarms:0	0 = Alarm 0 is not in Alert 1 = Alarm 0 is in Alert
Alarm0Danger	BOOL	Alarms:1	0 = Alarm 0 is not in Danger 1 = Alarm 0 is in Danger
Alarm1Alert	BOOL	Alarms:2	0 = Alarm 1 is not in Alert 1 = Alarm 1 is in Alert
Alarm1Danger	BOOL	Alarms:3	0 = Alarm 1 is not in Danger 1 = Alarm 1 is in Danger
Alarm2Alert	BOOL	Alarms:4	0 = Alarm 2 is not in Alert 1 = Alarm 2 is in Alert
Alarm2Danger	BOOL	Alarms:5	0 = Alarm 2 is not in Danger 1 = Alarm 2 is in Danger
Alarm3Alert	BOOL	Alarms:6	0 = Alarm 3 is not in Alert 1 = Alarm 3 is in Alert
Alarm3Danger	BOOL	Alarms:7	0 = Alarm 3 is not in Danger 1 = Alarm 3 is in Danger
Alarm4Alert	BOOL	Alarms:8	0 = Alarm 4 is not in Alert 1 = Alarm 4 is in Alert
Alarm4Danger	BOOL	Alarms:9	0 = Alarm 4 is not in Danger 1 = Alarm 4 is in Danger
Alarm5Alert	BOOL	Alarms:10	0 = Alarm 5 is not in Alert 1 = Alarm 5 is in Alert
Alarm5Danger	BOOL	Alarms:11	0 = Alarm 5 is not in Danger 1 = Alarm 5 is in Danger
Ch0Overall[2]	REAL		The measured overall value for Channel 0. Overall measures the amplitude of the vibration signal at all frequencies.
Ch0DCBiasGap[2]	REAL		The measured average DC offset of the transducer signal for Channel 0.
Ch0SumHarmonics[2]	REAL		The sum of the amplitude of the harmonics in the range from the specified starting order through the frequency maximum for Channel 0.
Ch0Not1X[2]	REAL		The measured magnitude of the vibration excluding the vibration at the machine speed for Channel 0.
Ch0Band0[2]	REAL		The measured band values for Channel 0.
Ch0Band1[2]	REAL		
Ch0Band2[2]	REAL		
Ch0Band3[2]	REAL		
Ch0Vector1XMagnitude[2]	REAL		The measured magnitude of the vibration at the machine speed for Channel 0.
Ch0Vector1XPhase[2]	REAL		The measured phase of the vibration at the machine speed for Channel 0.
Ch0Vector2XMagnitude[2]	REAL		The measured magnitude of the vibration at 2 times the machine speed for Channel 0.

Module-defined Data Type: AB:1440_VDP_7FFFFFFF:I:0[1]

Member Name	Type	Location	Description
Ch0Vector2XPhase[2]	REAL		The measured phase of the vibration at 2 times the machine speed for Channel 0.
Ch0Vector3XMagnitude[2]	REAL		The measured magnitude of the vibration at 3 times the machine speed for Channel 0.
Ch1Overall[2]	REAL		The measured overall value for Channel 1. Overall measures the amplitude of the vibration signal at all frequencies.
Ch1DCBiasGap[2]	REAL		The measured average DC offset of the transducer signal for Channel 1.
Ch1SumHarmonics[2]	REAL		The sum of the amplitude of the harmonics in the range from the specified starting order through the frequency maximum for Channel1.
Ch1Not1X[2]	REAL		The measured magnitude of the vibration excluding the vibration at the machine speed for Channel 1.
Ch1Band0[2]	REAL		The measured band values for Channel 1.
Ch1Band1[2]	REAL		
Ch1Band2[2]	REAL		
Ch1Band3[2]	REAL		
Ch1Vector1XMagnitude[2]	REAL		The measured magnitude of the vibration at the machine speed for Channel 1.
Ch1Vector1XPhase[2]	REAL		The measured phase of the vibration at the machine speed for Channel 1.
Ch1Vector2XMagnitude[2]	REAL		The measured magnitude of the vibration at 2 times the machine speed for Channel 1.
Ch1Vector2XPhase[2]	REAL		The measured phase of the vibration at 2 times the machine speed for Channel 1.
Ch1Vector3XMagnitude[2]	REAL		The measured magnitude of the vibration at 3 times the machine speed for Channel1.
Speed[2]	REAL		The measured speed value for the machine.
MaxSpeed[2]	REAL		The maximum speed value for the machine. This is the greatest measured speed value since the most recent reset. You can reset the Maximum Speed using MaxSpeedReset in the output tag.
Acceleration[2]	REAL		The measured acceleration value for the machine. The acceleration is the rate of change in the speed.
SMAXMagnitude[2]	REAL		The greatest peak magnitude around the orbit.
SMAXPhase[2]	REAL		The phase at which the greatest peak magnitude occurs around the orbit.

(1) The input data type name varies depending on the measurements you select in the Channel Data tab in the RSLogix 5000 software AOP. See Configure the Module Definition Properties on page 60.

(2) The measurement appears in the input data type only if you select it in the Channel Data tab. See Configure the Module Definition Properties on page 60.

Configuration Data Type

Module-defined Data Type: AB:1440_VDP_ChConfig_Struct:C:0

Member Name	Type	Default Display Style	Description
OverallFilterEN	BOOL	Decimal	0 = None 1 = Low Pass Filter
SynchronousModeEN	BOOL	Decimal	0 = Asynchronous (Default) 1 = Synchronous with tach
XdcrPower	SINT	Decimal	0 = Off (Default) 1 = IEPE 2 = +24V 3 = -24V 4 = Bias Current
XdcrSensitivityUnits	SINT	Decimal	0 = mV/ mil (Default) 1 = mV/ in/s 2 = mV/ g 3 = mV/ psi 4 = V/ V 5 = mV/ mm/s 6 = mV/ µm 8 = mV/ mbar 9 = V/ g
XdcrLLimit	REAL	Float	-24.0 to 24.0 volts (Default = -18.0 volts)
XdcrHLimit	REAL	Float	-24.0 to 24.0 volts (Default = -2.0 volts)
XdcrSensitivity	REAL	Float	Default = 200.0 (XdcrSensitivityUnits selection determines the units)
FullScale	REAL	Float	Default = 10.0 (FullScaleUnits selection determines the units)
FullScaleUnits	SINT	Decimal	0 = mil (Default) 1 = in/s 2 = g 3 = psi 4 = volt 5 = mmps 6 = µm 8 = mbar
SignalMeasurementType	SINT	Decimal	0 = RMS 1 = Calculated peak 2 = Calculate pk-pk 3 = True peak 4 = True pk-pk (Default)
FFTWindowType	SINT	Decimal	0 = Rectangular 1 = Hamming 2 = Hanning (Default) 3 = Flat Top 4 = Kaiser Bessel

Module-defined Data Type: AB:1440_VDP_ChConfig_Struct:C:0

Member Name	Type	Default Display Style	Description
HighPassFilterSelection	SINT	Decimal	0 = 0.2 Hz 1 = 1 Hz 2 = 5 Hz 3 = 10 Hz (Default) 4 = 40 Hz
FrequencyMax	INT	Decimal	Default = 1000
LowPassFilterSelection	INT	Decimal	200 to 20,000 (Default = 1000)
TachometerRotations	INT	Decimal	1 to 65,535 (Default = 1)
RotorRotations	INT	Decimal	1 to 65,535 (Default = 1)
SpectrumLineCount	DINT	Decimal	100, 200, 400, 800 (Default = 200)
AveragesCount	INT	Decimal	1 to 99 (Default = 1)
SelectedSumHarmonicsOrder	SINT	Decimal	0=1 1=2 2=3 3=4 4=5 (Default = 3)
Band0OrderModeEn	BOOL	Decimal	0 = Hz (Default) 1 = Orders
Band1OrderModeEn	BOOL	Decimal	0 = Hz (Default) 1 = Orders
Band2OrderModeEn	BOOL	Decimal	0 = Hz (Default) 1 = Orders
Band3OrderModeEn	BOOL	Decimal	0 = Hz (Default) 1 = Orders
Band0MaxPeakEn	BOOL	Decimal	0 = Band Overall (Default) 1 = Maximum Peak
Band1MaxPeakEn	BOOL	Decimal	0 = Band Overall (Default) 1 = Maximum Peak
Band2MaxPeakEn	BOOL	Decimal	0 = Band Overall (Default) 1 = Maximum Peak
Band3MaxPeakEn	BOOL	Decimal	0 = Band Overall (Default) 1 = Maximum Peak
Band0FrequencyMin	INT	Decimal	Default = 1
Band0FrequencyMax	INT	Decimal	Default = 10
Band1FrequencyMin	INT	Decimal	Default = 1
Band1FrequencyMax	INT	Decimal	Default = 10
Band2FrequencyMin	INT	Decimal	Default = 1
Band2FrequencyMax	INT	Decimal	Default = 10
Band3FrequencyMin	INT	Decimal	Default = 1
Band3FrequencyMax	INT	Decimal	Default = 10

Module-defined Data Type: AB:1440_VDP_AlarmConfig_Struct:C:0

Member Name	Type	Default Display Style	Description
LAlertLimit	REAL	Float	-999,999 to 999,999 (Default = -6)
HAlertLimit	REAL	Float	-999,999 to 999,999 (Default = 6)
LDangerLimit	REAL	Float	-999,999 to 999,999 (Default = -8)
HDangerLimit	REAL	Float	-999,999 to 999,999 (Default = 8)
Deadband	REAL	Float	0 to 9999 (Default = 0.1)
LimitMultiply	REAL	Float	0 to 10 (Default = 1.0)
SpeedLLimit	REAL	Float	0 to 9,999,999 (Default = 0)
SpeedHLimit	REAL	Float	0 to 9,999,999 (Default = 1000)
LimitMultiplyPeriod	INT	Decimal	0 to 65535 seconds (Default = 1.0)
Condition	SINT	Decimal	0 = Greater Than (Default) 1 = Less Than 2 = Inside Range 3 = Outside Range
MeasurementID	SINT	Decimal	0 = Ch 0 Overall (Default) 1 = Ch 1 Overall 2 = Ch 0 DC Bias/Gap 3 = Ch 1 DC Bias/Gap 4 = Ch 0 Band 0 5 = Ch 1 Band 0 6 = Ch 0 Band 1 7 = Ch 1 Band 1 8 = Ch 0 Band 2 9 = Ch 1 Band 2 10 = Ch 0 Band 3 11 = Ch 1 Band 3 12 = Speed 13 = SMAX Magnitude 14 = Ch 0 1X Magnitude 15 = Ch 1 1X Magnitude 16 = Ch 0 2X Magnitude 17 = Ch 1 2X Magnitude 18 = Ch 0 3X Magnitude 19 = Ch 1 3X Magnitude 20 = Ch 0 Not 1X 21 = Ch 1 Not 1X 22 = Ch 0 Sum Harmonics 23 = Ch 1 Sum Harmonics 24 = Ch 0 1X Phase 25 = Ch 1 1X Phase 26 = Ch 0 2X Phase 27 = Ch 1 2X Phase 28 = SMAX Phase 29 = Acceleration

Module-defined Data Type: AB:1440_VDP:C:0

Member Name	Type	Default Display Style	Description
Ch0			AB:1440_VDP_ChConfig_Struct:C:0
Ch1			AB:1440_VDP_ChConfig_Struct:C:0
TachAutoTriggerEn	BOOL	Decimal	0 = Manual Trigger 1 = Auto Trigger (Default)
TachTriggerSlope	BOOL	Decimal	0 = Positive 1 = Negative (Default)
TachInhibitZeroPulseFault	BOOL	Decimal	0 = No pulses on tachometer produces fault (Default) 1 = Inhibit zero pulses fault on tachometer
TachResponseTime	SINT	Decimal	0 = 2640.0 ms 1 = 220.0 ms (Default) 2 = 22.0 ms
TachFaultDelay	SINT	Decimal	1 to 64 seconds (Default = 11)
TachFaultLLimit	REAL	Float	-9,999,999 to 9,999,999 volts (Default = 2)
TachFaultHLimit	REAL	Float	-9,999,999 to 9,999,999 volts (Default = 18)
TachTriggerHysteresis	REAL	Float	0.0 to 50.0 (Default = 2.0) If TachAutoTriggerEn is set to 0, this value is volts. If TachAutoTriggerEn is set to 1, this value is % of the peak-to-peak input signal.
TachTriggerLevel	REAL	Float	-9,999,999 to 9,999,999 volts (Default = 0)
TachPulsesPerRevolution	INT	Decimal	Default = 1
Alarm0En	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm1En	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm2En	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm3En	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm4En	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm5En	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm0SpeedRangeEn	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm1SpeedRangeEn	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm2SpeedRangeEn	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm3SpeedRangeEn	BOOL	Decimal	0 = Disable (Default) 1 = Enable

Module-defined Data Type: AB:1440_VDP:C:0

Member Name	Type	Default Display Style	Description
Alarm4SpeedRangeEn	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm5SpeedRangeEn	BOOL	Decimal	0 = Disable (Default) 1 = Enable
Alarm0			AB:1440_VDP_AlarmConfig_Struct:C:0
Alarm1			AB:1440_VDP_AlarmConfig_Struct:C:0
Alarm2			AB:1440_VDP_AlarmConfig_Struct:C:0
Alarm3			AB:1440_VDP_AlarmConfig_Struct:C:0
Alarm4			AB:1440_VDP_AlarmConfig_Struct:C:0
Alarm5			AB:1440_VDP_AlarmConfig_Struct:C:0
RelayDelay	INT	Decimal	0 to 65535 seconds (Default = 1000)
RelayActivationLogic	SINT	Decimal	0 = A Only (Default) 1 = A OR B 2 = A AND B
RelayAlarmIDA	SINT	Decimal	Alarm number 0 to 5 (Default = 0)
RelayAlarmIDB	SINT	Decimal	Alarm number 0 to 5 (Default = 0)
RelayTripNormal	BOOL	Decimal	0 = Disable (Default) 1 = Enable
RelayTripAlert	BOOL	Decimal	0 = Disable (Default) 1 = Enable
RelayTripDanger	BOOL	Decimal	0 = Disable (Default) 1 = Enable
RelayTripDisarm	BOOL	Decimal	0 = Disable (Default) 1 = Enable
RelayTripXdcrFault	BOOL	Decimal	0 = Disable (Default) 1 = Enable
RelayTripModuleFault	BOOL	Decimal	0 = Disable (Default) 1 = Enable
RelayTripTachFault	BOOL	Decimal	0 = Disable (Default) 1 = Enable
RelayEn	BOOL	Decimal	0 = Disable Relay (Default) 1 = Enable Relay
RelayLatch	BOOL	Decimal	0 = Non-latching (Default) 1 = Latching
RelayFaultValue	BOOL	Decimal	0 = Energized (Default) 1 = De-energized
RelayIdleHoldEn	BOOL	Decimal	0 = Disable (Default) 1 = Enable

Output Data Type

Module-defined Data Type: AB:1440_VDP:O:0

Member Name	Type	Default Display Style	Description
Output0	SINT	Decimal	Contains the following values.
RelayReset	BOOL	Decimal	Resets all latched relays.
AlarmLimitMultiply	BOOL	Decimal	Multiply the alarm setpoints, or disarm the alarms during startup period.
MaxSpeedReset	BOOL	Decimal	Reset maximum speed.

Notes:

CIP Objects

This appendix defines the specific CIP Objects, Instances, Attributes, and Services supported by the Dynamic Measurement module.

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Identity Object (Class Code 01H)	104
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IMPORTANT

When the 1440-DYN02-RJ01 module is used with Logix controllers, Logix automatically configures most of the CIP objects using a Configuration Assembly. The Configuration Assembly overwrites the values of some attributes that may be set using the Services described in this appendix.

If you are using RSLogix 5000 software to configure the XM module, we recommend you do not use the Services in this appendix to configure signal processing, measurements, or alarms because it will conflict with the RSLogix 5000 configuration.

Use the Services to collect data, for example Spectrum and Time Waveforms. Since many measurements and diagnostic information is reported to Logix in the input tag, you only need to use these additional Services to collect data beyond what is available in the input tag. Refer to I/O Data Tags on page 91 for more information about the input tag.

Identity Object (Class Code 01_H)

The Identity Object provides identification and general information about the device.

Class Attributes

The Identity Object provides no class attributes.

Instance Attributes

Identity Object Instance Attributes

Attr ID	Access	Name	Data Type	Default Value
1	Get	Vendor ID	UINT	1 = Allen-Bradley
2	Get	Device Type	UINT	109 (Specialty I/O)
3	Get	Product Code	UINT	21 (0x15) XM Dynamic Measurement Module
4	Get	Revision: Major Minor	STRUCT OF USINT USINT	 Value varies with each firmware revision. Value varies with each firmware revision.
5	Get	Status	WORD	
6	Get	Serial Number	UDINT	
7	Get	Product Name	SHORT_ STRING	XM Dynamic Measurement Module

Status

The Status is a 16 bit value. The following bits are implemented.

Identity Object Status

Bit	Name	Description
0	Owned	TRUE indicates that the module has an owner. More specifically, the Predefined Master/Slave Connection Set has been allocated to a master.
1		Reserved, set to 0
2	Configured	This bit is set whenever a saved configuration is successfully loaded from non-volatile memory. This bit is cleared whenever the default configuration is restored or loaded.
3		Reserved, set to 0
4 - 7	Boot Program	Vendor-specific, indicates that the boot program is running. The Main Application must be corrupt or missing. Use ControlFlash to reload the Main Application.
8	Minor Recoverable Fault	Set whenever there is a transducer or tachometer fault.
9	Minor Unrecoverable Fault	Not implemented
10	Major Recoverable Fault	Set when there is a major recoverable fault.
11	Major Unrecoverable Fault	Set when there is a module status fault (Module Status LED is solid red).
12 - 15		Reserved, set to 0

ID_STATUS_SELF_TESTING	0x0000
ID_STATUS_NVS_UPDATE	0x0010
ID_STATUS_COMM_FAULT	0x0020
ID_STATUS_AWAIT_CONN	0x0030
ID_STATUS_CONNECTED	0X0060
ID_STATUS_IDLE	0X0070

Services

Identity Object Services

Service Code	Class/Instance Usage	Name
01_h	Instance	Get_Attributes_All
05_h	Instance	Reset
$0E_h$	Instance	Get_Attribute_Single
10_h	Instance	Set_Attribute_Single

DeviceNet Object (Class Code 03_H)

The DeviceNet Object is used to provide the configuration and status of a physical attachment to DeviceNet.

Class Attributes

DeviceNet Object Class Attributes

Attr ID	Access	Name	Data Type	Default Value
1	Get	Revision	UINT	2

Instance Attribute

DeviceNet Object Instance Attributes

Attr ID	Access	Name	Data Type	Default Value
1	Get	MAC ID	USINT	On DIP switches under label
2	Get	Baud Rate	USINT	The baud rate is determined by automatic baud rate detection (autobaud). The module listens to network traffic to determine the baud rate before it goes online.
3	Get	Bus-Off Interrupt	BOOL	0
4	Get/Set	Bus-Off Counter	USINT	0
5	Get	Allocation Information	STRUCT of BYTE USINT	0 255
100	Get	Autobaud Disable	BOOL	0 (always autobaud)

Services

DeviceNet Object Services

Service Code	Class/Instance Usage	Name
$0E_h$	Class/Instance	Get_Attribute_Single
10_h	Instance	Set_Attribute_Single
$4B_h$	Instance	Allocate_Master/Slave_Connection_Set
$4C_h$	Instance	Release_Group_2_Identifier_Set

Assembly Object (Class Code 04_H)

The Assembly Object binds attributes of multiple objects to allow data to or from each object to be sent or received in a single message.

The XM module provides both static and dynamic assemblies.

Class Attribute

Assembly Object Class Attributes

Attr ID	Access	Name	Data Type	Default Value
1	Get	Revision	UINT	2

Instances

Table B.1 Assembly Object Instances

Instance	Name	Type	Description
100	Vibration Alarm Values	Input	Alarm and Relay Status values
101	Default Poll Response Message	Input	Measurement values
142	Logix Configuration Assembly	Configuration	Used by Logix to configure the module
190	Logix Output Assembly	Output	Used by Logix for Output Tag
198	Logix Input Assembly	Input	Special Dynamic Assembly used only by Logix Controllers
199	Alternate Dynamic Poll Response Message	Input	User configurable measurement values and configuration parameters

Instance Attributes

Table B.2 Assembly Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Value
1	Get	Number of Members in list	UINT	Only supported for Dynamic Assembly instance
2	Set	Member List	Array of STRUCT:	Only supported for Dynamic Assembly instance
		Member Data Description	UINT	Size of member data value in bits
		Member Path Size	UINT	
		Member Path	Packed EPATH	
3	Get	Data	Defined in tables on the following pages.	

Assembly Instance Attribute Data Format

Instance 100 - Alarm and Relay Status

This assembly is sent using COS messaging when any of the Alarm or Relay Status values change.

Table B.3 Instance 100 Data Format (Alarm and Relay Status Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Relay 0 Status	Set Point Multiplier	Alarm 1 Status			Alarm 0 Status		
1	Reserved							
2	Reserved							
3	Reserved							
4	Reserved							
5	0	0	Alarm 11 Status			Alarm 10 Status		
6	0	0	Alarm 13 Status			Alarm 12 Status		
7	0	0	Alarm 15 Status			Alarm 14 Status		

Instance 101 - Measurement Values

This assembly instance can be selected to be sent in response to an I/O Poll Request from a Master.

Table B.4 Instance 101 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 - 3	Channel 0 Overall value							
4 - 7	Channel 1 Overall value							
8 - 11	Channel 0 Gap value (Analog Input Point (AIP) Object Instance #1)							
12 - 15	Channel 1 Gap value (AIP Object Instance #2)							
16 - 19	Speed value							
20 - 23	Maximum Speed value							
24 - 27	Channel 0 Band 0 value							
28 - 31	Channel 1 Band 0 value							
32 - 35	Channel 0 Band 1 value							
36 - 39	Channel 1 Band 1 value							
40 - 43	Channel 0 Band 2 value							
44 - 47	Channel 1 Band 2 value							
48 - 51	Channel 0 Band 3 value							
52 - 55	Channel 1 Band 3 value							

Table B.4 Instance 101 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
56 - 59	Channel 0 Vector 1 Magnitude value							
60 - 63	Channel 0 Vector 1 Phase value							
64 - 67	Channel 1 Vector 1 Magnitude value							
68 - 71	Channel 1 Vector 1 Phase value							
72 - 75	Channel 0 Vector 2 Magnitude value							
76 - 79	Channel 0 Vector 2 Phase value							
80 - 83	Channel 1 Vector 2 Magnitude value							
84 - 87	Channel 1 Vector 2 Phase value							
88 - 91	Channel 0 Vector 3 Magnitude value							
92 - 95	Channel 1 Vector 3 Magnitude value							
96 - 99	Channel 0 Not 1X value (AIP Object Instance #3)							
100 - 103	Channel 1 Not 1X value (AIP Object Instance #4)							
104 - 107	SMAX Magnitude value (AIP Object Instance #5)							
108 - 111	SMAX Phase value (AIP Object Instance #6)							
112 - 115	Channel 0 Sum Harmonics value (AIP Object Instance #7)							
116 - 119	Channel 1 Sum Harmonics (AIP Object Instance #8)							
120 - 123	Acceleration value							

Instance 199 - Dynamic Assembly

This Assembly instance can be created and configured with the XM Configuration Tool. Using the configuration software, you determine the format of the data. This assembly instance can be selected to be sent in response to an I/O Poll request from a Master.

The Dynamic Assembly can include all of the measurement values included in Assembly instance 101. In addition, the dynamic Assembly can include the following configuration parameters.

Table B.5 Instance 199 Component Mapping

EPATH (where ii = instance number)	Class Name	Class Number	Instance Number	Attribute Name	Attribute Number	Data Type
21 1D 03 24 ii 30 04	Alarm	$31D_h$	1 - 16	AlarmEnable	4	BOOL
21 1D 03 24 ii 30 05	Alarm	$31D_h$	1 - 16	Type	5	USINT
21 1D 03 24 ii 30 07	Alarm	$31D_h$	1 - 16	AlarmCondition	7	USINT
21 1D 03 24 ii 30 08	Alarm	$31D_h$	1 - 16	AlarmHAlertLimit	8	REAL
21 1D 03 24 ii 30 09	Alarm	$31D_h$	1 - 16	AlarmHDangerLimit	9	REAL
21 1D 03 24 ii 30 0A	Alarm	$31D_h$	1 - 16	AlarmLAlertLimit	10	REAL

Table B.5 Instance 199 Component Mapping

EPATH (where ii = instance number)	Class Name	Class Number	Instance Number	Attribute Name	Attribute Number	Data Type
21 1D 03 24 ii 30 0B	Alarm	$31D_h$	1 - 16	AlarmLDangerLimit	11	REAL
21 1D 03 24 ii 30 0C	Alarm	$31D_h$	1 - 16	AlarmDeadband	12	REAL
21 1D 03 24 ii 30 0D	Alarm	$31D_h$	1 - 16	AlarmLimitMultiply (Setpoint Multiplication function)	13	REAL
21 1D 03 24 ii 30 0E	Alarm	$31D_h$	1 - 16	AlarmLimitMultiplyPeriod	14	UINT
21 1D 03 24 ii 30 0F	Alarm	$31D_h$	1 - 16	AlarmSpeedRangeEn	15	BOOL
21 1D 03 24 ii 30 10	Alarm	$31D_h$	1 - 16	AlarmSpeedHLimit	16	REAL
21 1D 03 24 ii 30 11	Alarm	$31D_h$	1 - 16	AlarmSpeedLLimit	17	REAL
21 0F 00 24 ii 30 01	Param	$0F_h$	10 - 25	Parameter Value (AlarmMeasurementID)	1	USINT
21 23 03 24 ii 30 04	Relay	323_h	1	RelayEn	4	BOOL
21 23 03 24 ii 30 05	Relay	323_h	1	RelayLatch	5	BOOL
21 23 03 24 ii 30 06	Relay	323_h	1	RelayFaultValue	6	BOOL
21 23 03 24 ii 30 07	Relay	323_h	1	RelayDelay	7	UINT
21 23 03 24 ii 30 09	Relay	323_h	1	RelayAlarmLevel	9	BYTE
21 0F 00 24 ii 30 01	Param	$0F_h$	26 - 30	Parameter Value (RelayAlarmIDA)	1	USINT
21 0F 00 24 ii 30 01	Param	$0F_h$	31 - 35	Parameter Value (RelayAlarmIDB)	1	USINT
21 23 03 24 ii 30 0C	Relay	323_h	1 - 5	RelayActivationLogic	12	USINT
21 23 03 24 ii 30 0E	Relay	323_h	1 - 5	RelayInstalled	14	BOOL

The dynamic Assembly instance must be instantiated with a call to the class level Create service. Then the structure can be defined with the Set_Attribute_Single service for the Member List attribute. Only one dynamic Assembly instance is supported so subsequent calls to the Create service will return a Resource Unavailable (0x02) error. The Delete service can be used to destroy the dynamic Assembly instance so that it can be re-created.

Services

Table B.6 Assembly Object Services

Service Code	Class/Instance Usage	Name
$0E_h$	Class/Instance	Get_Attribute_Single
10_h	Instance	Set_Attribute_Single(1)
08_h	Class	Create
09_h	Instance	Delete

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Connection Object (Class ID 05H)

The Connection Object allocates and manages the internal resources associated with both I/O and Explicit Messaging Connections.

Class Attributes

The Connection Object provides no class attributes.

Instances

Table B.7 Connection Object Instances

Instance	Description
1	Explicit Message Connection for pre-defined connection set
2	I/O Poll Connection
3	I/O Strobe Connection
4	I/O COS (change of state) Connection
11 - 17	Explicit Message Connection

Instance Attributes

Table B.8 Connection Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description
1	Get	State	USINT	State of the object.
2	Get	Instance Type	USINT	Indicates either I/O or Messaging Connection.
3	Get	Transport Class Trigger	BYTE	Defines behavior of the Connection.
4	Get	Produced Connection ID	UINT	Placed in CAN Identifier Field when the Connection transmits.
5	Get	Consumed Connection ID	UINT	CAN Identifier Field value that denotes message to be received.
6	Get	Initial Comm Characteristics	BYTE	Defines the Message Group(s) across which productions and consumptions associated with this Connection occur.
7	Get	Produced Connection Size	UINT	Maximum number of bytes transmitted across this Connection.
8	Get	Consumed Connection Size	UINT	Maximum number of bytes received across this Connection.
9	Get/Set	Expected Packet Rate	UINT	Defines timing associated with this Connection.
12	Get/Set	Watchdog Time-out Action	USINT	Defines how to handle Inactivity/Watchdog timeouts.
13	Get	Produced Connection Path Length	UINT	Number of bytes in the production_connection_path attribute.
14	Get	Produced Connection Path	Array of USINT	Specifies the Application Object(s) whose data is to be produced by this Connection Object. See DeviceNet Specification Volume 1 Appendix I.

Table B.8 Connection Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description
15	Get	Consumed Connection Path Length	UINT	Number of bytes in the consumed_connection_path attribute.
16	Get	Consumed Connection Path	Array of USINT	Specifies the Application Object(s) that are to receive the data consumed by this Connection Object. See DeviceNet Specification Volume 1 Appendix I.
17	Get	Production Inhibit Time	UINT	Defines minimum time between new data production.

Services

Table B.9 Connection Object Services

Service Code	Class/Instance Usage	Name
05_h	Instance	Reset
$0E_h$	Instance	Get_Attribute_Single
10_h	Instance	Set_Attribute_Single

Discrete Input Point Object (Class ID 08H)

The Discrete Input Point Object stores information about the value of the Setpoint Multiplier signal.

Class Attributes

Table B.10 Discrete Input Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Get	Revision	UINT	Revision of the implemented object.	2

Instance Attributes

Table B.11 Discrete Input Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Value	BOOL	Alarm Limit Multiplier	0 = Off 1 = On
199	Set	Backdoor Service	USINT	Setting this attribute is equivalent to requesting the specified service.	Set to one of the following values to perform the specified service: 32_h = Open 33_h = Close The virtual Setpoint Multiplier switch can be set with the AlarmLimitMultiply output tag in RSLogix 5000 software. Refer to I/O Data Tags on page 91.

Services

Table B.12 Discrete Input Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Class/Instance	Get_Attribute_Single	Returns the contents of the specified attribute.
10_h	Instance	Set_Attribute_Single	Sets the contents of the specified attribute.
32_h	Instance	Open	Opens the virtual Setpoint Multiplier switch[(1)].
33_h	Instance	Close	Closes the virtual Setpoint Multiplier switch[(1)].

(1) The AlarmLimitMultiply output tag in the RSLogix 5000 software can also set the Setpoint Multiplier switch. It will not overwrite this service.

Analog Input Point (Class ID $0A_H$)

The Analog Input Point Object models simple analog measurements performed by the Dynamic Measurement module.

Class Attributes

Table B.13 Analog Input Point Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Get	Revision	UINT	Revision of the implemented object.	2

Instances

Table B.14 Analog Input Point Object Instances

Instance	Name	Description
1	Ch0DCBiasGap	Gap measurement for Channel 0
2	Ch1DCBiasGap	Gap measurement for Channel 1
3	Ch0Not1X	Not 1X measurement for Channel 0
4	Ch1Not1X	Not 1X measurement for Channel 1
5	SMAXMagnitude	SMAX magnitude of synchronized channels
6	SMAXPhase	SMAX phase of synchronized channels
7	Ch0SumHarmonics	Sum Harmonics measurement for Channel 0
8	Ch1SumHarmonics	Sum Harmonics measurement for Channel 1

Instance Attributes

Table B.15 Analog Input Point Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Value	REAL		

Table B.15 Analog Input Point Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
4	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults 1 = Alarm or fault condition exists. The **Value** attribute may not represent the actual field value.
8	Get	Value Data Type	USINT	Determines the data type of the **Value**.	1 = REAL
147	Get	Data Units	ENGUNIT	The units context of the **Value** attribute.	See DeviceNet Specification Volume 1 Appendix K.

Services

Table B.16 Analog Input Point Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Class/Instance	Get_Attribute_Single	Returns the contents of the specified attribute.

Parameter Object (Class ID $0F_H$)

The Parameter Object provides the interface to the Dynamic Measurement module configuration data. There are 39 Parameter Object instances implemented in the module.

Parameter Object instances 1-4 and 7-37 are implemented to provide an alternate method of setting the configuration parameters with EPATH or ENGUNIT data types. And Parameter Object instances 38 and 39 provide an alternate method of setting the Produced Connection Size and Produced Connection Path attributes for the Poll Connection because these attributes can be difficult to get/set directly through the Connection Object. Note that these cannot be set if there is an active Poll Connection.

Parameter Object instances 5 and 6 are for setting the starting order for the Sum Harmonics measurements.

Class Attributes

Table B.17 Parameter Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
2	Get	Max Instance	UINT	Maximum instance number of an object in this class.	Total number of parameter object instances.
8	Get	Parameter Class Descriptor	WORD	Bits that describe the parameter.	Bit 0 Supports Parameter Instances Bit 1 Supports Full Attrib. Bit 2 Must do non-volatile store Bit 3 Params in non-volatile
9	Get	Config. Assembly Instance	UINT		Set to 0

Instances

There are 39 instances of this object.

Table B.18 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
1	No	Transducer 1 Sensitivity Units	USINT	0 = mil 1 = in/s 2 = g 3 = psi 4 = volts 5 = mm/s 6 = µm 7 = Pa 8 = mbar	0
2	No	Transducer 2 Sensitivity Units	USINT	(same as above)	0
3	No	Channel 0 Measurement Units	USINT	0 = mil 1 = in/s 2 = g 3 = psi 4 = volts 5 = mm/s 6 = µm 7 = Pa 8 = mbar	0
4	No	Channel 1 Measurement Units	USINT	(same as above)	0

Table B.18 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
5	No	Starting Order for Channel 0 Sum Harmonics meas.	USINT	0=1 1=2 2=3 3=4 4=5	3
6	No	Starting Order for Channel 1 Sum Harmonics meas.	USINT	1-5	2
7		Reserved			
8		Reserved			
9	No	Transducer 3 (Tachometer) Sensitivity Units	USINT	0 = mil 1 = in/s 2 = g 3 = psi 4 = volts 5 = mm/s 6 = µm 7 = Pa 8 = mbar	0
10	No	Alarm 0 Measurement ID	USINT	0 = CH 0 Overall 1 = CH 1 Overall 2 = CH 0 Gap 3 = CH 1 Gap 4 = CH 0 Band 0 5 = CH 1 Band 0 6 = CH 0 Band 1 7 = CH 1 Band 1 8 = CH 0 Band 2 9 = CH 1 Band 2 10 = CH 0 Band 3 11 = CH 1 Band 3 12 = Speed 13 = SMAX Mag. 14 = CH 0 1X Mag. 15 = CH 1 1X Mag. 16 = CH 0 2X Mag. 17 = CH 1 2X Mag. 18 = CH 0 3X Mag. 19 = CH 1 3X Mag. 20 = CH 0 Not 1X 21 = CH 1 Not 1X 22 = CH 0 Sum Harmonics 23 = CH 1 Sum Harmonics 24 = CH 0 1X Phase 25 = CH 1 1X Phase 26 = CH 0 2X Phase 27 = CH 1 2X Phase 28 = SMAX Phase 29 = Acceleration	0
11	No	Alarm 1 Measurement ID	USINT	(same as above)	1
12	No	Alarm 2 Measurement ID	USINT	(same as above)	0

Table B.18 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
13	No	Alarm 3 Measurement ID	USINT	(same as above)	1
14	No	Alarm 4 Measurement ID	USINT	(same as above)	0
15	No	Alarm 5 Measurement ID	USINT	(same as above)	1
16	No	Alarm 6 Measurement ID(1)	USINT	(same as above)	0
17	No	Alarm 7 Measurement ID(1)	USINT	(same as above)	1
18	No	Alarm 8 Measurement ID(1)	USINT	(same as above)	0
19	No	Alarm 9 Measurement ID(1)	USINT	(same as above)	1
20	No	Alarm 10 Measurement ID(1)	USINT	(same as above)	0
21	No	Alarm 11 Measurement ID(1)	USINT	(same as above)	1
22	No	Alarm 12 Measurement ID(1)	USINT	(same as above)	0
23	No	Alarm 13 Measurement ID(1)	USINT	(same as above)	1
24	No	Alarm 14 Measurement ID(1)	USINT	(same as above)	0
25	No	Alarm 15 Measurement ID(1)	USINT	(same as above)	1
26	No	Relay 0 Alarm ID A	USINT	0 = Alarm 0 1 = Alarm 1 2 = Alarm 2 3 = Alarm 3 4 = Alarm 4 5 = Alarm 5 6 = Alarm 6 7 = Alarm 7 8 = Alarm 8 9 = Alarm 9 10 = Alarm 10 11 = Alarm 11 12 = Alarm 12 13 = Alarm 13 14 = Alarm 14 15 = Alarm 15	0
27	No	Reserved			0
28	No	Reserved			0
29	No	Reserved			0
30	No	Reserved			0
31	No	Relay 0 Alarm ID B	USINT	(same as 26 above)	0
32	No	Reserved			0
33	No	Reserved			0
34	No	Reserved			0
35	No	Reserved			0

Table B.18 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
36	Yes	Channel 0 Vector Measurement Speed Data Units	USINT	0 = CPM 1 = Orders	0
37	Yes	Channel 1 Vector Measurement Speed Data Units	USINT	0 = CPM 1 = Orders	0
38	No	Poll Connection Produced Connection Path(2)	USINT	101, 198, 199 (Assembly Object Instance number)	101
39	No	Poll Connection Produced Connection Size(2)	UINT	4 - 124	124

(1) Alarms 6-15 are not available when the module is configured in the RSLogix 5000 software.

(2) The Poll Connection Produced Connection Path and Size parameters cannot be set while the Poll connection is already established with a master/scanner. Attempting to do so will result in an Object State Conflict error (error code 0xC) These Parameter instances are a little more flexible than the actual Connection Object attributes because they can be set while the connection is in the NON-EXISTENT state (before the master/scanner allocates the connection).

Instance Attributes

Table B.19 Parameter Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Set	Parameter Value		Actual value of parameter	See Table B.18 for a list of valid values for each instance.
2	Get	Link Path Size	USINT	Size of Link Path	0 (These Parameter instances do not link directly to another object attribute.)
3	Get	Link Path	ARRAY of DeviceNet path	DeviceNet path to the object for the Parameter value.	
		Segment Type/Port	BYTE	See DeviceNet Specification Volume 1 Appendix I for format.	
		Segment Address		See DeviceNet Specification Volume 1 Appendix I for format.	

Table B.19 Parameter Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
4	Get	Descriptor	WORD	Description of Parameter	Bit 0 = Settable Path support Bit 1 = Enum Strings support Bit 2 = Scaling support Bit 3 = Scaling Links support Bit 4 = Read Only Bit 5 = Monitor Bit 6 = Ext. Prec. scaling
5	Get	Data Type	EPATH	Data Type Code	See DeviceNet Specification Volume 1 Appendix J, Section J-6.
6	Get	Data Size	USINT	Number of Bytes in Parameter value.	

Services

Table B.20 Parameter Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Class/Instance	Get_Attribute_Single	Returns the contents of the specified attribute.
10_h	Class	Set_Attribute_Single	Sets the contents of the specified attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Acknowledge Handler Object (Class ID 2BH)

The Acknowledge Handler Object is used to manage the reception of message acknowledgments. This object communicates with a message producing Application Object within a device. The Acknowledge Handler Object notifies the producing application of acknowledge reception, acknowledge timeouts, and production retry limit errors.

Class Attributes

The Acknowledge Handler Object provides no class attributes.

Instances

A module provides only a single instance (instance 1) of the Acknowledge Handler Object. This instance is associated with instance 4 of the Connection Object, the slave COS connection to a higher level master.

Instance Attributes

Table B.21 Acknowledge Handler Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Default Value
1	Get/Set	Acknowledge Timer	UINT	16 ms
2	Get/Set	Retry Limit	USINT	1
3	Get	COS Producing Connection Instance	UINT	4

Services

Table B.22 Acknowledge Handler Object Services

Service Code	Class/Instance Usage	Name
$0E_h$	Instance	Get_Attribute_Single
10_h	Instance	Set_Attribute_Single

Alarm Object (Class ID 31DH)

The Alarm Object models a two-stage (alert and danger levels) alarm.

Class Attributes

Table B.23 Alarm Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Get	Revision	USINT	Revision of the implemented object.	2 (indicates that **Threshold Multiplier** is a REAL instead of USINT)

Instances

There are 16 instances of this object.

IMPORTANT Alarms 6 through 15 are not available when the module is configured in the RSLogix 5000 software.

Instance Attributes

Table B.24 Alarm Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Alarm Status	3 BITS	The current status of the alarm.	0 = Normal 1 = Alert (alarm) 2 = Danger (shutdown) 3 = Disarm 4 = Xdcr Fault 5 = Module Fault 6 = Tachometer Fault
4	Get/Set	Alarm Enable	BOOL	Indicates whether this alarm object is enabled.	0 = Disabled 1 = Enabled
5	Get	Type	USINT	Type of Alarm	0 = Magnitude 1 = Vector
6	Get	Threshold Units	USINT	Indicates whether the thresholds and deadband value are specified in units of measure. Not applicable to vector alarms.	Set to 1 1 = Measurement units
7	Get/Set	AlarmCondition	USINT	Indicates on which side of the threshold values the alarm and danger conditions exist. Not applicable to vector alarms.	0 = Greater than 1 = Less than 2 = Inside range 3 = Outside range
8	Get/Set	AlarmHAlertLimit	REAL	The threshold value for the alert state of the alarm. (For range conditions, this is the greater threshold value.)	
9	Get/Set	AlarmHDangerLimit	REAL	The threshold value for the Danger state of the alarm. (For range conditions, this is the greater threshold value).	

Table B.24 Alarm Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
10	Get/Set	AlarmLAlertLimit	REAL	The lesser threshold value for the Alert state of the alarm with a range condition type.	
11	Get/Set	AlarmLDangerLimit	REAL	The lesser threshold value for the Danger state of the alarm with a range condition type.	
12	Get/Set	AlarmDeadband	REAL	The amount on the safe side of a threshold by which the value must recover to clear the alarm.	
13	Get/Set	AlarmLimitMultiply (Setpoint Multiplier)	REAL	Indicates how the threshold should be adjusted when the setpoint multiplication function is invoked.	0 = Disable alarm > 0 = Multiply the thresholds by the value
14	Get/Set	AlarmLimitMultiplyPeriod	UINT	The amount of time that the Threshold (Setpoint) Multiplier is applied after the startup signal is received.	Seconds
15	Get/Set	AlarmSpeedRangeEn	BOOL	Indicates whether this alarm is enabled only within a certain machine speed range.	0 = No speed range (alarm is always enabled) 1 = Speed range (alarm only enabled within speed range)
16	Get/Set	AlarmSpeedHLimit	REAL	Indicates the greater threshold of the machine speed range for which the alarm is enabled (disabled at greater speeds).	CPM (must be greater than **AlarmSpeedLLimit**)
17	Get/Set	AlarmSpeedLLimit	REAL	Indicates the lesser threshold of the machine speed range for which the alarm is enabled (disabled at lesser speeds).	CPM (Must be less than **AlarmSpeedHLimit**)
18	Get/Set	Name	STRING2	A name to help identify this alarm.	
19	Get/Set	Measurement Identifier	EPATH	Identifies the measurement object to which this alarm is applied.	See Parameter Object instances 10 to 25. See Table B.18 on page 118.

Services

Table B.25 Alarm Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Band Measurement Object (Class ID $31E_H$)

The Band Measurement Object models the measurement of the amplitude of a signal within a narrow frequency range.

Class Attributes

The Band Measurement Object provides no class attributes.

Instances

There are 8 instances of this object.

Table B.26 Band Measurement Object Instances

Instance	Description
1	Channel 0 Band Measurement #0
2	Channel 1 Band Measurement #0
3	Channel 0 Band Measurement #1
4	Channel 1 Band Measurement #1
5	Channel 0 Band Measurement #2
6	Channel 1 Band Measurement #2
7	Channel 0 Band Measurement #3
8	Channel 1 Band Measurement #3

Instance Attributes

Table B.27 Band Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Band Value	REAL	The measured band value.	See **Data Units**
4	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults 1 = Alarm or fault condition exists, the **Band Value** attribute may not represent the actual field value.
5	Get	Data Units	ENGUNIT	The units context of the **Band Value** attribute.	This attribute is read only. It is set according to the **Output Data Units** attribute of the associated Channel Object instance. See page 128.
6	Get/Set	Measurement	USINT	The measurement (or calculation) performed to produce the **Band Value**.	0 = RSS 1 = Peak
7	Get/Set	Minimum Frequency	REAL	The minimum frequency that is included in the band measurement.	
8	Get/Set	Maximum Frequency	REAL	The maximum frequency that is included in the band measurement.	The Maximum Frequency must be greater than or equal to **Minimum Frequency**.
9	Get/Set	Frequency Units	USINT	The units of **Minimum** and **Maximum Frequency**.	0 = Hz 1 = Orders

Services

Table B.28 Band Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Channel Object (Class ID $31F_H$)

The Channel Object models front-end processing performed on an input signal before specific measurements are performed. This processing typically includes gain, filtering, and/or integration.

Channel Attributes

The Channel Object provides no class attributes.

Instances

There are 2 instances of this object.

Instance Attributes

Table B.29 Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get/Set	Output Data Units	ENGUNIT	The data units of the signal resulting from the signal processing performed in the channel.	See DeviceNet Specification Volume 1 Appendix K. Also see Parameter Object Instances 3 and 4. Valid values: g = 1504_h in/sec = $2B07_h$ mil = 0800_h psi = 1300_h volt = $2D00_h$ mm/s = 0900_h µm = 2204_h Pa = 1309_h mbar = 1308_h This setting is directly related to the **Sensitivity Units** of the associated transducer and the **Level of Integration** performed on the channel.
4	Get	Integration Level of Integration	USINT	The level of integration to perform on the signal.	0 = None 1 = Single 2 = Double

Table B.29 Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
5	Get/Set	Low Cutoff Frequency	USINT	The effective high pass filter (low frequency corner) selection.	0 = Very low (0.2 Hz) 1 = Low (1 Hz) 2 = Medium (5 Hz) 3 = High (10 Hz) 4 = Very high (40 Hz) See attributes 100 to 104.
6	Get/Set	Synchronous	BOOL	Indicates whether this channel is synchronized with the tachometer signal.	0 = Asynchronous 1 = Synchronous
7	Get/Set	Internal Gear Teeth	UINT	The number of gear teeth on the shaft of interest.	The **Internal/External Gear Teeth** values are used when synchronous operation is selected but there is a known speed difference between the shaft of interest and the shaft used as the tachometer source.
8	Get/Set	External Gear Teeth	UINT	The number of gear teeth on the shaft used as the tachometer source.	
9	Get/Set	Name	STRING2	A name to help identify this channel.	
10	Get/Set	Full Scale	REAL	The maximum signal expected to be processed by the channel.	It is set according to the Output Data Units attribute on attribute on page 128. Setting the Full Scale to a greater value allows the channel to handle greater input signals without saturating or clipping. Setting the Full Scale to a lesser value allows the signal to be measured with greater resolution.
100	Get	Very Low HPF Corner Frequency	REAL	The frequency, in Hz, of the "Very low" **Low Cutoff Frequency** option for attribute 5.	Hz
101	Get	Low HPF Corner Frequency	REAL	The frequency, in Hz, of the "Low" **Low Cutoff Frequency** option for attribute 5.	Hz
102	Get	Medium HPF Corner Frequency	REAL	The frequency, in Hz, of the "Medium" **Low Cutoff Frequency** (low frequency corner) option for attribute 5.	Hz
103	Get	High HPF Corner Frequency	REAL	The frequency, in Hz, of the "High" **Low Cutoff Frequency** option for attribute 5.	Hz

Table B.29 Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
104	Get	Very High HPF Corner Frequency	REAL	The frequency, in Hz, of the "Very high" **Low Cutoff Frequency** option for attribute 5.	Hz
105	Get	Channel Alarm Status	USINT	Summary of the Alarms configured for this channel.	0 = Normal 1 = Alert (alarm) 2 = Danger (shutdown) 3 = Disarm

Services

Table B.30 Channel Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Device Mode Object (Class ID 320_H)

The Device Mode Object is used to control access to the configuration parameters in the module. This object's Device Mode attribute must be in PROGRAM mode to allow the module's configuration parameters to be Set (see Services). Attempts to set the configuration parameters while the Device Mode is in RUN mode will return an error. Note that the module collects measurements while in RUN mode but not while it is in PROGRAM mode.

Class Attributes

The Device Mode Object provides no class attributes.

Instance Attributes

Table B.31 Device Mode Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get/Set	Device Mode	UINT	The operating mode of the module.	0 = Power Up 1 = RUN 2 = PROGRAM
199	Set	Backdoor Service	USINT	Setting this attribute is equivalent to requesting the specified service.	Set to one of the following values to perform the specified service: 05_h = Reset 09_h = Delete 15_h = Restore 16_h = Save

Setting the **Device Mode** attribute to 1 (RUN) is equivalent to executing the **Start** service. Setting the **Device Mode** attribute to 2 (PROGRAM) is equivalent to executing the **Stop** service.

Services

Table B.32 Device Mode Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Return the value of a single attribute.
10_h	Instance	Set_Attribute_Single	Set the value of a single attribute.
07_h	Instance	Stop	Transitions from Run to the Program state.
06_h	Instance	Start	Validate the device configuration settings and transition to the Run state if OK.
05_h	Instance	Reset	Transition to the Power Up state. Load the non-volatile configuration and transition to the Run state if saved configuration restored.

Table B.32 Device Mode Object Services

Service Code	Class/Instance Usage	Name	Description
16_h	Instance	Save	Validate the device configuration settings if necessary and save them to non-volatile memory.
09_h	Instance	Delete	Delete the saved configuration from non-volatile memory.
15_h	Instance	Restore	Load the saved configuration or the factory default configuration from non-volatile memory.

Overall Measurement Object (Class ID 322_H)

The Overall Measurement Object models the measurement of the amplitude of a signal including a wide frequency range.

Class Attributes

The Overall Measurement Object provides no class attributes.

Instances

There are 2 instances of this object.

Instance Attributes

Table B.33 Overall Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Overall Value	REAL	Measured value	The output value of the measurement performed by the Overall Measurement Object on the input signal. The result of the measurement process specified by **Measurement** is converted to the units specified by **Data Units** to produce the Overall Value.

Table B.33 Overall Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
4	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults. 1 = Alarm or fault condition exists. The **Overall Value** attribute may not represent the actual field value.
5	Get	Data Units	ENGUNIT	The units context of the **Overall Value** attribute.	This setting is determined by the Channel Object's **Output Data Units** attribute (see page 128).
6	Get/Set	Measurement	USINT	The measurement (or calculation) performed to produce the **Overall Value**.	0 = RMS 1 = RMS peak 2 = RMS pk-to-pk 3 = Peak 4 = Peak-to-peak 5-255 Reserved
7	Get	Time Constant	REAL	The detection time constant associated with the output smoothing filter (for the RMS and DC meters) or the decay rate of the peak meters.	This setting is based on the **Low Frequency Cutoff** (Channel object) and **Measurement** (attribute 6). If **Measurement** is set to 3 or 4, the Overall Time Constant is 1.5 seconds. If **Measurement** is set to 0, 1, or 2, the table below shows the Time Constant.
8	Get	Damping Factor	REAL	The damping factor associated with output smoothing filter for the RMS and DC meters (not used with peak meters).	1.0
9	Get/Set	Overall Filter	USINT	Overall filter type applied to the input signal before the measurement is performed.	0 = None 1 = Low Pass Filter 2-255 Reserved
10	Get/Set	Low Pass Corner Frequency	UINT	The corner frequency of the low pass filter.	200 to 20000 Hz

Low Frequency Cutoff	Overall Time Constant
0.2 Hz	0.8
1 Hz	0.16
5 Hz	0.045
10 Hz	0.045
40 Hz	0.045

Services

Table B.34 Overall Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Relay Object (Class ID 323_H)

The Relay Object models a relay (actual or virtual). A relay can be activated or deactivated based on the status of one or more alarms.

Class Attributes

Table B.35 Relay Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Number of Instances	UINT	Number of Instances in this class.	5
100	Set	Reset All	USINT	Setting this attribute is equivalent to executing the Class Reset service	Reset All is an attribute that provides a way to perform a Class level Reset service via the Set_Attribute_Single service. Setting this attribute to any value is equivalent to performing the Class level Reset service. Reading the Reset All attribute always returns zero.

Instances

There is one instance of the object. Instance 1 is a virtual relay which corresponds with the Relay LED on the module.

Instance Attributes

Table B.36 Relay Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Relay Status	BOOL	The current status of the relay.	0 = Off 1 = On
4	Get/Set	Relay Enable	BOOL	Indicates whether this relay object is enabled.	0 = Disabled 1 = Enabled
5	Get/Set	Latch Enable	BOOL	Indicates whether this relay latches (requires a reset command to deactivate).	0 = Nonlatching 1 = Latching
6	Get/Set	Failsafe Enable	BOOL	Indicates whether this relay is normally energized (activated during power loss).	0 = Non-failsafe (not normally energized) 1 = Failsafe (normally energized)
7	Get/Set	Delay	UINT	The time period that the voting logic must be true before the relay is activated.	0...65.535 seconds (specified in milliseconds)
8	Get/Set	Name	STRING2	A name to help identify the relay.	18 characters maximum
9	Get/Set	Alarm Level	BYTE	Specifies what alarm status values will cause the relay to activate.	0 = Normal 1 = Alert 2 = Danger 3 = Disarm 4 = Xdcr Fault 5 = Module Fault 6 = Tachometer Fault
10	Get/Set	Alarm Identifier A	EPATH	Identifies the first alarm status the relay monitors.	See Parameter Object instances 26 to 30.
11	Get/Set	Alarm Identifier B	EPATH	Identifies the second alarm status the relay monitors.	See Parameter Object instances 31 to 35. See Table B.18 on page 118.

Table B.36 Relay Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
12	Get/Set	Logic	USINT	Indicates the number of associated alarms that must have a status value specified by **Alarm Level** in order to activate the relay.	0 = Ignore **Alarm Identifier B** and activate the relay based on the status of **Alarm Identifier A**. 1 = Activate the relay if the status of either **Alarm Identifier A** or **B** matches any of the statuses specified by **Alarm Level**. 2 = Activate the relay if the status of both **Alarm Identifier A** and **B** match any of the statuses specified by **Alarm Level**.
14	Get	Relay Installed	BOOL	Indicates whether an actual relay is associated with this instance.	0 = Not installed 1 = Installed
15	Get/Set	Idle Hold	USINT	Hold relay state during reconfiguration.	0 = Relay is deactivated while module is in Program mode. 1 = Relay retains last state while in Program mode.

Services

Table B.37 Relay Object Services

Service Code	Class/Instance Usage	Name	Description
05_h	Class/Instance	Reset	Resets latched relay.
$0E_h$	Class/Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Class/Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Spectrum Waveform Measurement Object (Class ID 324_H)

The Spectrum/Waveform Measurement Object models a spectrum and waveform measurement.

When requesting the first byte of waveform or spectra data the module copies the most recently sampled live measurement to a hold buffer where it is held until the entire measurement is uploaded to the host, or until a new first byte request is made. If the measurement mode is synchronous, and the channels have the same number of orders and number of lines, then when the first byte of the channel 0 data is requested, the module copies the simultaneous measurements for both channel 0 and channel 1 to the hold buffer.

Class Attributes

The Spectrum/Waveform Measurement Object provides no class attributes.

Instances

There are 2 instances of this object.

Instance Attributes

Table B.38 Spectrum Waveform Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults. 1 = Alarm or fault condition exists. The Spectrum and Waveform data may not represent the actual field value.
4	Get	Data Units	ENGUNIT	The units context of the **Data** attributes.	This setting is determined by the Channel Object's **Output Data Units** attribute (see page 128).
5	Get	Domain	USINT	The domain used for the spectrum and waveform measurements.	0 = Frequency/Time 1 = Order/Position

Table B.38 Spectrum Waveform Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
6	Get/Set	FMAX	REAL	The maximum frequency or order of the spectrum data.	0...20000 Hz if **Domain** = 0. There are several predetermined FMAX settings for which spectrum data can be produced. If you select an unsupported value, then the next greater supported FMAX value will be used for the spectrum data. 4...40 Orders if **Domain** = 1.The **Number of Lines** value must be evenly divisible by the FMAX value or an Invalid Device Configuration error will be returned during the Device Mode Object Start and Save services.
7	Get/Set	Number of Spectrum Lines	UDINT	Number of lines or bins in the spectrum data.	100, 200, 400, or 800
8	Get/Set	Window Type	USINT	The window function to be applied to the waveform data prior to computing the spectrum.	0 = Rectangular 1 = Hamming 2 = Hanning 3 = Flat Top 4 = Kaiser Bessel
9	Get/Set	Period	REAL	The period of the waveform.	Seconds if **Domain** = 0. Cycles if **Domain** = 1.
10	Get	Number of Waveform Points	UDINT	Number of points in the waveform data.	256, 512, 1024, or 2048
11	Get	Overlap	USINT	The percent overlap applied to the waveform data sets used for calculating the spectrum.	Only 0% supported.

Table B.38 Spectrum Waveform Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
12	Get	Data Format	USINT	The format of the spectrum data.	0 = Complex data
13	Get	Average Type	USINT	The type of averaging performed.	0 = Asynchronous (spectrum) 1 = Synchronous (waveform) Determined by the **Synchronous** attribute of the Channel Object. When set to Asynchronous, consecutive spectrum measurements are averaged together to produce the **Spectrum** data. When set to synchronous, synchronized waveforms are averaged together to produce the **Waveform** data, and the **Spectrum** data is produced from the averaged waveform. A trigger source from a tachometer, for example, is required to obtain the synchronized waveforms.
14	Get/Set	Number of Averages	UINT	The number of individual data sets to be incorporated into the average calculation.	0 = Invalid 1 = No averaging > 1 = Averaging

Services

Table B.39 Spectrum Waveform Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)
$4B_h$	Instance	Get_Spectrum_Chunk	Upload a portion of the current Spectrum data.
$4C_h$	Instance	Get_Waveform_Chunk	Upload a portion of the current Waveform data.

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Get_Spectrum_Chunk/Get_Waveform_Chunk

These services return a portion of the respective data structure. It is likely that the spectrum and waveform data structures will be too large to transfer over the network in one message. These services allow the data structures to be transferred over the network in smaller portions so that the explicit message buffer does not need to be so large.

The Spectrum Data structure contains an array of values that, taken together, are the output of the spectrum measurement performed by the Spectrum/Waveform Measurement Object on the input signal. The size of the Spectrum Data structure and format of the data array depends on the **Data Format** attribute. In all cases, the spectrum data array values are normalized and must be converted to floating point to obtain the true values.

Table B.40 Spectrum Data Structure

Byte (DWORD) offset within structure	Structure Member	Data Type	Description
0 (0)	Number of Spectrum Lines	UDINT	Number of lines or bins in the spectrum data. This should be equal to the **Number of Spectrum Lines** attribute setting. It is provided within this structure to assist in determining the size of the structure.
4 (1)	FMAX	REAL	The maximum frequency or order of the spectrum data. This is the actual FMAX of the spectrum data and may vary from the **FMAX** attribute setting.
8 (2)	Amplitude Reference	REAL	Normalization factor This factor is used to convert the normalized array data into floating point values.
12 (3)	Normalized Value Array	Array of INT or UINT	The normalized spectrum data points These must be converted to floating point values using the Amplitude Reference value. The **Data Format** attribute determines whether these are INT or UINT and exactly what conversion should be applied.

The total size of the Spectrum Data structure in DWORD is:

- For Real or Power Data Format: 3 + (**Number of Spectrum Lines** / 2)
- For Complex Data Format: 3 + (**Number of Spectrum Lines**)

If the data format is Real Data or Power Data then the **Normalized Value Array** is an array of UINT (16-bit unsigned integers ranging from 0 to 65535). The number of UINTs in the spectrum data array is equal to the **Number of**

Spectrum Lines. To convert the normalized spectrum data into floating point values, use the following equation:

$$\text{Float Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_n}{32768}$$

Where **Float Data$_n$** is the value for the nth spectrum bin, and 0 ≤n ≤**Number of Spectrum Line**.

The **Float Data** value represents an amplitude value if Data Format is real data. The **Float Data** represents a power value if Data Format is power data.

If the data format is Complex Data then the **Normalized Value Array** is an array of INT (16-bit signed integers ranging from -32768 to 32767). There are two INTs (real and imaginary values) in the array for each spectrum bin (the array size is twice the **Number of Spectrum Lines**). To convert the normalized spectrum data into real and imaginary values, use the following equations:

$$\text{Real Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_{2n}}{32768}$$

$$\text{Imaginary Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_{(2n+1)}}{32768}$$

Where **Real Data$_n$** and **Imaginary Data$_n$** are the real and imaginary values for the nth spectrum bin, and 0 ≤n ≤**Number of Spectrum Line**.

The **Real Data** and **Imaginary Data** values are converted into magnitude and phase values with the following equations:

$$\text{Magnitude Data}_n = \sqrt{\text{Real Data}_n^{\,2} + \text{Imaginary Data}_n^{\,2}}$$

$$\text{Phase Data}_n = \arctan\left(\frac{\text{Imaginary Data}_n}{\text{Real Data}_n}\right)$$

The Waveform Data structure contains an array of values that, taken together, are the output of the sampling performed by the Spectrum/Waveform Measurement Object on the input signal. The Waveform Data array values are normalized and must be converted to floating point to obtain the true values.

Table B.41 Waveform Data Structure

Byte (DWORD) offset within structure	Structure Member	Data Type	Description
0 (0)	Number of Waveform Points	UDINT	Number of points in the waveform data. This should be equal to the **Number of Waveform Points** attribute setting. It is provided within this structure to assist in determining the size of the structure.
4 (1)	Period	REAL	The period of the waveform. This is the actual period of the waveform and may vary from the **Period** attribute setting.
8 (2)	Amplitude Reference	REAL	Normalization factor This factor is used to convert the normalized array data into floating point values.
12 (3)	Normalized Value Array	Array of INT	The normalized waveform data points These must be converted to floating point values using the Amplitude Reference value.

The total size of the Waveform Data structure in DWORDs is: 3 + (**Number of Waveform Points** / 2)

The Waveform Data is an array of INT (16-bit signed integers ranging from -32768 to 32767). The number of INTs in the Waveform Data array is equal to the **Number of Waveform Points**. To convert the normalized Waveform Data into floating point values, use the following equations:

$$\text{Float Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_n}{32768}$$

Where **Float Data$_n$** is the value for the nth waveform point, and 0 ≤n ≤ **Number of Waveform Points**.

The Get_Spectrum_Chunk and Get_Waveform_Chunk services use the same request and response parameters.

Table B.42 Get_Spectrum_Chunk/Get_Waveform_Chunk Request Parameters

Name	Data Type	Description of Request Parameters	Semantics of Values
Initial DWORD Offset	UINT	The offset of the first 32-bit value within the data structure to be returned.	0 <= offset < size of the data structure in DWORDs. For example: offset = 0 refers to bytes 0-3 (the number of lines or points value) offset = 1 refers to bytes 4-7 (the FMAX or period values) offset = 2 refers to bytes 8-11 (the amplitude reference value) offset = 3 refers to bytes 12-15 (the first pair of normalized values) offset = 4 refers to bytes 16-19 (the second pair of normalized values) ....
Number of DWORDs	USINT	The number of 32-bit values from the data structure to be returned.	This should be small enough to fit in the explicit message buffer. This will likely be less than the total size of the data structure so that several calls to the service will be required to get the entire data structure.

Table B.43 Get_Spectrum_Chunk/Get_Waveform_Chunk Response Parameters

Name	Data Type	Description of Response Parameters	Semantics of Values
Number of DWORDs	USINT	The number of 32-bit values actually returned in the Data Chunk array of the response. (Can be less than the number of DWORDs requested.)	If less DWORDs are returned than were requested, the end of the data structure has been reached (the request went beyond the end of the array).
Data Chunk	Array of DWORD	The requested portion of the data structure.	

Speed Measurement Object (Class ID 325_H)

The Speed Measurement Object models a speed measurement of a tachometer signal.

Class Attributes

The Speed Measurement Object provides no class attributes.

Instance Attributes

Table B.44 Speed Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Speed Value	REAL	The measured speed value.	CPM
4	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults. 1 = Alarm or fault condition exists. The **Speed Value** attribute may not represent the actual field value.
5	Get	Maximum Speed	REAL	The maximum (peak) measured speed value since the most recent reset.	CPM
12	Get	Time Constant	UINT	The time constant value used for exponential averaging of the **Speed Value** (a low pass filter/output smoothing filter).	Milliseconds You can set this using the TachResponseTime configuration tag in the RSLogix 5000 software. Refer to I/O Data Tags on page 91.
13	Get	Acceleration	REAL	The rate of change of the **Speed Value**.	CPM/min
14	Get/Set	Measurement Response	USINT	Determines how quickly the Speed measurement responds to change. For example, setting this attribute to 1 indicates a settling time of 220 ms. This means that the speed is averaged over a quarter second, and the reported value will reach 90% of the new steady state value about 220 ms after the change in machine speed.	See table below. **Meas. Response** / **Settling Time** / **Time Constant** 0 / 2640 ms / 1200 ms 1 / 220 ms / 100 ms 2 / 22 ms / 10 ms

Services

Table B.45 Speed Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
05_h	Instance	Reset	Clears Maximum (Peak) speed to 0.
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Tachometer Channel Object (Class ID 326_H)

The Tachometer Channel Object models front end processing performed on a tachometer signal before specific measurements are performed.

Class Attributes

The Tachometer Channel Object provides no class attributes.

Instance Attributes

Table B.46 Tachometer Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get/Set	Number of Pulses per Revolution	UINT	The number of signal pulses per revolution of the shaft (for example number of gear teeth).	0 = Tachometer disabled > 0 = Tachometer enabled
4	Get/Set	Auto Trigger	BOOL	Indicates whether the trigger level is determined automatically from the signal.	0 = Use specified **Trigger Level, Trigger Slope**, and **Hysteresis** 1 = Automatically determine trigger level and trigger slope, and use the specified **Hysteresis**
5	Get/Set	Trigger Level	REAL	The signal level to be used as the trigger.	Volts
6	Get/Set	Trigger Slope	USINT	The slope of the signal at the threshold crossing to be used as the trigger.	0 = Positive 1 = Negative

Table B.46 Tachometer Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
7	Get/Set	Trigger Hysteresis	REAL	The amount of hysteresis around the trigger level.	In **Auto Trigger** mode, this value is a percentage of the peak-to-peak input signal and can range from 0 to 50%. In **Manual Trigger** mode, this value is a voltage level (the hysteresis voltage is added or subtracted to the threshold voltage to determine the hysteresis range).
8	Get/Set	Name	STRING2	A name to help identify this channel.	18 characters maximum
10	Get/Set	Fault Time-out	USINT	Number of seconds with no pulses before a Tach Fault is indicated unless **Zero Pulse Fault Inhibit** is set to 1.	1 to 64 seconds
11	Get/Set	Zero Pulse Fault Inhibit	BOOL	Lack of Tach Pulses does not cause a Tach Fault.	0 = A lack of tach pulses constitutes a Tach Fault 1 = A lack of tach pulses does not constitute a Tach Fault

Services

Table B.47 Tachometer Channel Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Transducer Object (Class ID 328_H)

The Transducer Object models a transducer.

Class Attributes

The Transducer Object provides no class attributes.

Instances

There are 3 instances of this object.

Table B.48 Band Measurement Object Instances

Instance	Descriptions
1	Vibration Channel 0
2	Vibration Channel 1
3	Tachometer Channel

Instance Attributes

Table B.49 Transducer Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	DC Bias	REAL	The measured average DC bias of the transducer signal in volts.	Volts
4	Get	Status	BOOL	Indicates whether a transducer fault exists (the measured **DC Bias** is outside the range specified by **Fault High** and **Low**).	0 = No fault 1 = A transducer fault exists
5	Get/Set	Sensitivity Value	REAL	Value of the sensitivity of the transducer in millivolts per **Sensitivity Units**.	This value must be +/- 15% of the Nominal Sensitivity value.

Table B.49 Transducer Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
6	Get/Set	Sensitivity Units	ENGUNIT	Units of the denominator of the **Sensitivity Value**.	See DeviceNet Specification Volume 1 Appendix K. Also see Parameter Object instances 1 and 2 (page 118). Valid values: g = 1504_h in/sec = $2B07_h$ mil = 0800_h psi = 1300_h volt = $2D00_h$ mm/s = 0900_h µm = 2204_h mbar = 1308_h Pa = 1309_h
7	Get/Set	Fault High	REAL	The maximum expected DC Bias voltage from the transducer in volts.	Volts A reading above this value causes a transducer fault, which is indicated by the Channel LED flashing red.
8	Get/Set	Fault Low	REAL	The minimum expected DC Bias voltage from the transducer in volts.	Volts
9	Get/Set	Power Type	USINT	Indicates the type of power supplied to the transducer.	0 = Off 1 = IEPE (externally supplied) 2 = +24V (externally applied) 3 = -24V (externally applied from terminal base) 4 = Bias Current (externally supplied)
13	Get	DC Bias Time Constant	REAL	The time constant value used for exponential averaging of the **DC Bias** value (a low pass filter/output smoothing filter).	1.769 seconds

Services

Table B.50 Transducer Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.
10_h	Instance	Set_Attribute_Single	Sets a single attribute.(1)

(1) Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Vector Measurement Object (Class ID 329_H)

The Vector Measurement Object models the measurement of the amplitude and phase of the input signal at a specific multiple of the machine speed.

Class Attributes

The Vector Measurement Object provides no class attributes.

Instances

There are 6 instances of this object.

Table B.51 Vector Measurement Object Instances

Instance	Description
1	Channel 0 1X Vector Measurement
2	Channel 1 1X Vector Measurement
3	Channel 0 2X Vector Measurement
4	Channel 1 2X Vector Measurement
5	Channel 0 3X Vector Measurement
6	Channel 1 3X Vector Measurement

Instance Attributes

Table B.52 Vector Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Magnitude Value	REAL	The measured magnitude value.	
4	Get	Phase Value	REAL	The measured phase value.	Degrees **Note:** Not valid for instances 5 and 6.
5	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms of faults. 1 = Alarm or fault condition exists. The **Value** attributes may not represent the actual field value.
6	Get	Magnitude Data Units	ENGUNIT	The units context of the **Magnitude Value** attribute.	This setting is determined by the Channel Object's **Output Data Units** setting (see page 128).
7	Get	Speed Value	REAL	The speed at which the magnitude and phase are measured.	Instances 1 and 2 use 1X machine speed. Instances 3 and 4 use 2X machine speed. Instances 5 and 6 use 3X machine speed. The value is only valid when synchronous sampling mode is selected for the corresponding channel.
8	Get	Speed Data Units	ENGUNIT	The units context of the **Speed Value** attribute.	See DeviceNet Specification Volume 1 Appendix K. This is set to Orders.

Services

Table B.53 Vector Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
$0E_h$	Instance	Get_Attribute_Single	Returns a single attribute.

averaging

The process of combining multiple data samples to minimize the influence of transient signals so that the real characteristics of machine vibration can be determined.

alarm

An alarm alerts you to a change in a measurement. For example, an alarm can notify you when the measured vibration level for a machine exceeds a pre-defined value.

band

A frequency range, such as the frequency range between 1,800 and 3,200 Hz.

baud rate

The baud rate is the speed at which data is transferred over the XM Bus. The available data rates depend on the type of cable and total cable length used on the network:

	Maximum Cable Length		
Cable	**125 K**	**250 K**	**500 K**
Thick Trunk Line	500 m (1,640 ft.)	250 m (820 ft.)	100 m (328 ft.)
Thin Trunk Line	100 m (328 ft.)	100 m (328 ft.)	100 m (328 ft.)
Maximum Drop Length	6 m (20 ft.)	6 m (20 ft.)	6 m (20 ft.)
Cumulative Drop Length	156 m (512 ft.)	78 m (256 ft.)	39 m (128 ft.)

The1440-DYN02-01RJ module baud rate is determined by automatic baud rate detection (autobaud). The module listens to network traffic to determine the baud rate before it goes online.

bus off

A bus off condition occurs when an abnormal rate of errors is detected on the Control Area Network (CAN) bus in a device. The bus-off device cannot receive or transmit messages on the network. This condition is often caused by corruption of the network data signals due to noise or baud rate mismatch.

data type

A definition of the size and layout of memory that will be allocated when a tag of the data type is created. Data types can be atomic, structure, or array.

disarm state

See Program mode.

Earth/Ground

A conducting path between an electric circuit or equipment and ground for safety or EMC reduction.

Electronic Data Sheet (EDS) Files

EDS files are simple text files that are used by network configuration tools such as the RSNetWorx for DeviceNet software to describe products so that you can easily commission them on a network. EDS files describe a product device type, revision, and configurable parameters, and can be uploaded from the module using RSLinx software.

frequency

The repetition rate of a periodic event, usually expressed in cycles per second (Hz) or revolutions per minute (rpm), or multiples of a rotational speed (orders).

Help window

A window that contains help topics that describe the operation of a program. These topics may include:

- An explanation of a command.
- A description of the controls in a dialog box or property page.
- Instructions for a task.
- Definition of a term.

high pass filter

A filter that excludes all frequencies below a defined frequency. It allows, or passes, frequencies above the defined frequency. It is useful for removing low frequency signal components that would dominate the signal.

low pass filter

A low pass filter excludes frequencies above a defined frequency. It allows, or passes, frequencies below the defined frequency. It is useful as an anti-aliasing filter.

noise

Any component of a transducer output signal that does not represent the variable intended to be measured.

NVS (Non-Volatile Storage)

NVS is the permanent memory of an XM module. Modules store parameters and other information in NVS so that they are not lost when the module loses power (unless Auto Save is disabled). Some implementations of NVS include EEPROM and Flash.

online help

Online help allows you to get help for your program on the computer screen by pressing **F1.** The help that appears in the Help window is context sensitive, which means that the help is related to what you are currently doing in the program.

orders

Multiples of the operating speed of a piece of equipment. The first order is the operating speed. The second order is two times the operating speed, and so on.

Period

The time required for a complete oscillation or for a single cycle of events. The reciprocal of frequency.

Phase

A measurement of the timing relationship between two signals, or between a specific vibration event and a keyphasor pulse.

Program mode

The XM module is idle. In Program mode, the signal processing/measurement process is stopped. The status of the alarms is set to the disarm state to prevent a false alert or danger status.

Run mode

In Run mode, the module collects measurement data and monitors each measurement device.

settling time

The amount of time it takes a measurement to reach 90% of the final value given a step change in the input signal.

signal detection

Defines the method of conditioning or measuring a dynamic input signal. Peak (0 to the peak voltage), Peak-Peak (minimum peak to maximum peak), and RMS (square root of the mean of the square of the values) are the most common methods of signal detection.

spectrum measurement

A measure of amplitude versus frequency, typically vibration for monitoring systems. Spectrum measurements are useful for identifying the contribution of individual components (bearings, fans, gears) It is much easier to separate elements of vibration in frequency domain that in the time domain.

transducer

A transducer is a device for making measurements. These include accelerometers, velocity pickups, displacement probes, and temperature sensors.

virtual relay

A virtual relay is a non-physical relay. It has the same capabilities (monitor alarms, activation delay, change status) as a physical relay only without any physical or electrical output. The virtual relay provides additional relay status inputs to a controller, or PLC.

XM configuration

XM configuration is a collection of user-defined parameters for XM modules.

XM node address

The XM Bus network can have as many as 64 devices connected to it. Each device on the XM Bus network must have a unique XM node address between 0 and 63. Node address 63 is the default used by uncommissioned devices and node address 0 is reserved for the 1440-ACNR adapter.

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